

corresponding to a relatively low load that the resulting user throughput for a 5 MHz channel bandwidth was in the range of 1.7 to 2 Mbps at an RSRP per RE = PDSCH per RE = -113 dBm. These simulations assumed that the users had access to all of the available RBs. An approximate doubling of this throughput is estimated for a 10 MHz x 10 MHz deployment.

Table 2 also calculates the total PDSCH signal power for the RB allocations shown to be -93.2 and -92.4 dBm respectively for 5 MHz x 5 MHz deployments and 10 MHz x 10 MHz deployments. These values represent the actual signal power that the terminal receiver has to work with to recover the transmitted data stream. Although it is often convenient to do calculations on a per RE basis, the receiver processes the total signal power.

Table 2. AT&T's Derivation of SINR, number of RBs required and total PDSCH power.

Parameter	5 MHz	10 MHz	Comment
Received average power of PDSCH per RE, dBm	-113	-116	PDSCH per RE is equal to RSRP per RE since 3 dB RS power boost is countered by 3 dB power combining gain of PDSCH when in transmit diversity mode at cell edge.
Receive thermal noise power per RE, dBm	-122.2	-122.2	Calculated in the RE bandwidth of 15 kHz with a 10 dB terminal noise figure.
Interference power per RE, dBm	-119.8	-122.8	In this analysis the interference is restricted to the RS interference from other cells assuming (1) a 95 th percentile cell geometry value of -2.2 dB; (2) an instantaneous to average power conversion factor of about -11.7 dB, and (3) RSRP values before adjustment of -113 and -116 dBm for 5 and 10 MHz.
"Interference plus Noise" per RE, dBm	-117.8	-119.5	Linear addition of interference and noise.
Received SINR, dB	4.8	3.5	PDSCH per RE minus "Interference plus Noise" per RE.
Implementation margin, dB	3	3	Margin to account for any additional losses not considered.
Received SINR with implementation margin, dB	1.8	0.5	Received SINR minus implementation margin.
Bit rate per RB, Mbps	0.132	0.109	Key link level assumptions include: (1) MIMO mode = transmit diversity; (2) Extended Pedestrian A (EPA) channel model with 5 Hz Doppler frequency; and (3) maximum of 4 HARQ transmissions.
Number of RBs required	8	19	Number of RBs required to support at least 1 and 2 Mbps. Since allocations are in integer number of RBs the respective values calculated by dividing the throughputs by the bit rate per RB are rounded up to the next

			highest number.
Actual throughput supported, Mbps	1.06	2.07	Bit rate per RB times number of RBs.
Number of REs allocated to PDSCH in dB	19.8	23.6	8*12 = 96 REs for 5 MHz, 19*12 = 228 REs for 10 MHz.
Total received PDSCH signal power, dBm	-93.2	-92.4	Summation of PDSCH per RE and number of REs allocated to PDSCH.

AT&T's Uplink ("UL") Target Data Rates

The target data rates (i.e. throughputs) that can be supported on the LTE UL are a function of the Maximum Allowable Path Loss (MAPL) that can be supported on the DL, which is based upon a DL signal level corresponding to a total RS power of -90 dBm as defined above. As shown in Table 3 below, the MAPL that corresponds to a -90 dBm total RS power is 104.1 dB for both 5 MHz x 5 MHz and 10 MHz x 10 MHz deployments. Even though the RS Energy per Resource Element (EPRE) for a 5 MHz x 5 MHz (23 dBm) is greater than for a 10 MHz x 10 MHz (20 dBm) deployment (see row 4), the total RS power for each of the two transmit paths for both bandwidth allocations are equivalent and equal to 40 dBm because the number of REs allocated to 10 MHz is twice that allocated to 5 MHz (100 REs compared to 50 REs; see row 5).

Table 3. AT&T's Derivation of Maximum Allowable Path Loss (MAPL) (All calculations are in dBs).

Parameter	5 MHz x5 MHz	10 MHz x10 MHz	Comment
Transmit power per transmit path, dBm	44.77	44.77	30 watts of transmit power for each of two transmit paths (total 60 watts). Our current LTE deployment is based upon two transmit paths at the base station and the same total power for both bandwidth allocations.
Total number of subcarriers in dB	24.77	27.77	300 subcarriers for 5 MHz x 5 MHz 600 subcarriers for 10 MHz x 10 MHz
Reference Signal (RS) power boost, dB	3	3	Resource Elements (REs) allocated to RS are given 3 dB more power than REs allocated to data traffic
RS Energy Per RE (EPRE) per transmit path, dBm	23	20	Transmit power minus total number of subcarriers plus RS power boost
Number of REs allocated to RS in dB	17	20	In OFDM symbols that carry the RS, 50 REs are allocated for 5 MHz x 5 MHz, and 100 REs are allocated for 10 MHz x 10 MHz
Total RS power for each transmit path,	40	40	RS EPRE plus number of REs allocated to RS

dBm			
Base station antenna gain, dBi	14.8	14.8	Antenna gain representative of a 6 foot dual-polarized antenna at 700 MHz
Cable loss, dB	0.5	0.5	This loss is based upon Remote Radio Head (RRH) located at tower top thus minimizing cable length
Total RS transmit EIRP, dBm	54.3	54.3	Total RS power plus base station antenna gain minus cable loss
Shadowing margin, dB	7.3	7.3	Based upon shadowing margin standard deviation of 7 dB for rural environment and 95% cell area coverage probability
Best server selection gain, dB	3.1	3.1	A mobile at cell edge can handover to a neighbor cell with more favorable shadowing
Total RS power signal level, dBm	-90	-90	Coverage signal level defined above
MAPL, dB	140.1	140.1	Total RS transmit EIRP minus shadowing margin plus best server selection gain minus total RS power signal level

An UL link budget is used to determine the UL throughput that can be supported based upon a MAPL of 140.1 dB. Table 4 summarizes the link budget analyses for 128 kbps and 256 kbps UL data service. As shown in Table 4, the resulting MAPLs for no loading (interference margin = 0 dB) are 143.5 dB for 128 kbps and 140.3 dB for 256 kbps. Using linear extrapolation, the UL throughput supported for a MAPL of 140.1 dB is about 264 kbps, as throughput increases with decreasing MAPL. Assuming an interference margin of 3 dB, which corresponds to 100% loading in a somewhat coverage-limited scenario, the MAPLs for 128 kbps and 256 kbps each decrease by 3 dB to 140.5 dB and 137.3 dB, respectively. Using linear interpolation, the resulting UL throughput for a MAPL of 140.1 dB is about 144 kbps.

Table 4. AT&T's LTE UL link budgets to support 128 and 256 kbps.

Parameter	Units	128 kbps	256 kbps	Comment
Average effective data rate	kbps	128	256	UL throughput supported
Number of Resource Blocks (RBs)		3	4	Close to optimum for specified throughput. There is a trade-off between receiver noise bandwidth and required SINR.
Mobile transmit power	dBm	23	23	Transmit power for LTE mobiles
Mobile antenna gain	dBi	-5	-5	Representative device antenna gain at 700 MHz
Service body loss	dB	1	1	Typical body loss for wireless data card

Mobile transmit EIRP	dBm	17	17	Mobile transmit power plus mobile antenna gain minus service body loss
Receive noise power density	dBm/Hz	-174	-174	Standard noise power spectral density at room temperature
Base station noise figure	dB	2.5	2.5	Typical value for LTE eNodeB
Target UL SINR	dB	-0.4	1.5	Based upon the Extended Vehicular A (EVA) channel model at 3 km/h; 10% Block Error Rate (BLER) for the first HARQ transmission; MCS2 for 128 kbps, MCS5 for 256 kbps.
Base station sensitivity	dBm	-114.6	-111.4	SINR plus receive noise power spectral density plus base station noise figure plus receiver bandwidth, where the latter is equal to number of RBs times 180 kHz.
Base station antenna gain	dBi	14.8	14.8	Antenna gain representative of a 6 foot dual-polarized antenna at 700 MHz
Cable loss	dB	0.5	0.5	This loss is based upon RRH located at tower top thus minimizing cable length
Interference margin	dB	0.0	0.0	No load condition
Frequency selective scheduling gain	dB	1.8	1.8	Gain achieved based upon scheduler being able to select best RBs for a given user
Best server selection gain	dB	3.1	3.1	A mobile at cell edge can handover to a neighbor cell with more favorable shadowing
Shadowing margin	dB	7.3	7.3	Based upon shadowing margin standard deviation of 7 dB for rural environment and 95% cell area coverage probability
MAPL	dB	143.5	140.3	Mobile transmit EIRP minus base station sensitivity plus base station antenna gain minus cable loss minus interference margin plus frequency selective scheduling gain plus best server selection gain minus shadowing margin

In summary, the UL throughput that can be supported ranges from about 144 kbps to about 264 kbps depending on loading. These throughputs are representative of what is achievable in LTE deployments at the cell edge. Note that these values are the same for both 5 MHz x 5 MHz and 10 MHz x 10 MHz deployments, as it has been assumed that the number of RBs allocated is the same for both bandwidths.

AT&T's Conversion of RS to Total Received Signal Power.

The signal level for this license is defined in terms of total RS power. If the Commission seeks to convert the total RS power to the total received signal power, the following conversion chart is provided:

Table 5. Conversion from total RS power to total received signal power.

Parameter	Value	Comment
Total RS power, dBm	-90	Coverage signal level defined above
Ratio of number of REs carrying data to number of REs carrying reference signals, dB	7.8	The number of REs that carry downlink data in OFDM symbols dedicated to data transmission is equal to 300 and 600 for 5 MHz x 5 MHz and 10 MHz x 10 MHz, respectively. The number of REs that carry reference signals in OFDM symbols is equal to 50 and 100 for 5 MHz x 5 MHz and 10 MHz x 10 MHz, respectively. Thus, the ratio is equal to 6 (7.8 dB) for both bandwidth allocations.
RS power boost, dB	3	REs allocated to RS are given 3 dB more power than REs allocated to data traffic
Total received signal power, dBm	-85.2	Total RS power plus ratio defined in second row minus RS power boost. This term does not include any interference or noise power, and is preferred over the Received Signal Strength Indicator (RSSI), which does typically include the interference and noise power.

AT&T's Coverage and Service Area Prediction Tool

The distance to contours for each lower 700 MHz site is calculated using network design and analysis propagation models. These propagation models are based on the COST-231 Hata model, defined as follows:

$$L = 46.3 + 33.9\log(f) - 13.82\log(H_b) - a(H_m) + [44.9 - 6.55\log(H_b)]\log(d) + C$$

where

$$a(H_m) = (1.1\log(f) - 0.7)H_m - (1.56\log(f) - 0.8)$$

AT&T's Calculation of Geographic Area of Licensed Area and Coverage/Service

The license build performance under Commission rule Section 27.14(g) (i.e. where coverage is provided and service offered) can be determined using the formula,

$$\frac{\text{Covered Licensed Area (sq. mi.)}}{\text{Modified Licensed Area (sq. mi.)}}$$

where:

- Licensed Area = The number of square miles within the licensed service area as generated by Alteryx, a data compiling, analysis, and reporting tool that can conduct spatial calculations, including distances in square miles between set boundaries. Lands

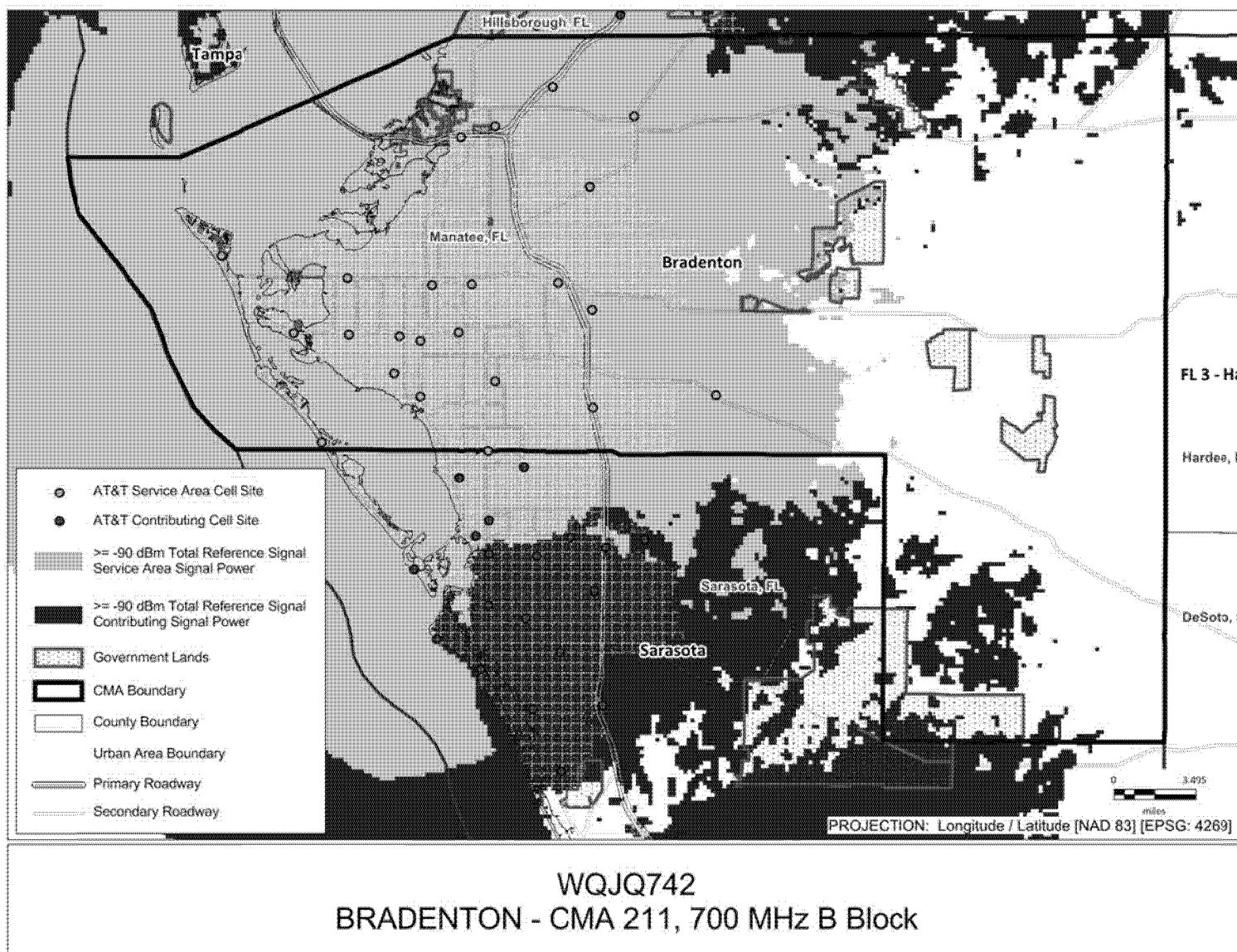
owned by tribal governments and lands held by the Federal Government in trust or for the benefit of a recognized tribe are included in the Licensed Area.

- Covered Licensed Area = The total geographic area within the Licensed Area where coverage is provided and service offered.
- Modified Licensed Area = The Licensed Area minus the geographic area within the Licensed Area that is Government Lands where coverage is provided and service offered.
- Government Lands = Areas that are owned or administered by Federal Government agencies and entities and areas that are owned or managed by States, as explained by Commission Order.¹ The geographic area (sq. mi.) comprising Government Lands was generated based on data from NationalAtlas.com for Federal lands and from the State Parks files in StreetPro and/or the GeoSpatial Data Gateway of the United States Department of Agriculture, National Resources Conservation Service, for State lands. For this license, Government Lands comprising 3% of the Licensed Area were excluded from the Licensed Area.

Conclusion

Using the methodologies above as provided by AT&T, coverage is provided and service offered in an area in excess of the 35% performance benchmark.

¹ See Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, *Second Report and Order* at 67 (2007).



Reference Copy Only. Do Not Mail to the FCC as an Application.

Submitted: 06/28/2013 at 16:45:24
File Number: 0005839407

FCC 601
Main Form

FCC Application for Radio Service Authorization: Wireless Telecommunications Bureau Public Safety and Homeland Security Bureau

Approved by OMB
3060 - 0798
See instructions for
public burden estimate

1) Radio Service Code: WY	1a) Existing Radio Service Code:
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General Information

2) (Select only one) (NT) NE - New RO - Renewal Only AU - Administrative Update NT - Required Notifications MD - Modification RM - Renewal/Modification WD - Withdrawal of Application EX - Requests for Extension of Time AM - Amendment CA - Cancellation of License DU - Duplicate License RL - Registered Location/Link	
3a) If this application is for a <u>D</u> evelopmental License, <u>D</u> emonstration License, or a <u>S</u> pecial Temporary Authorization (STA), enter the code and attach the required exhibit as described in the instructions. Otherwise enter ' <u>N</u> ' (Not Applicable).	(N) <u>D</u> <u>M</u> <u>S</u> <u>N/A</u>
3b) If this application is for Special Temporary Authority due to an emergency situation, enter 'Y'; otherwise enter 'N'. Refer to Rule 1.915 for an explanation of situations considered to be an emergency.	() <u>Yes</u> <u>No</u>
4) If this application is for an Amendment or Withdrawal, enter the file number of the pending application currently on file with the FCC.	File Number
5) If this application is for a Modification, Renewal Only, Renewal/Modification, Cancellation of License, Duplicate License, or Administrative Update, enter the call sign of the existing FCC license. If this is a request for Registered Location/Link, enter the FCC call sign assigned to the geographic license.	Call Sign
6) If this application is for a New, Amendment, Renewal Only, or Renewal/Modification, enter the requested authorization expiration date (this item is optional).	MM DD /
7) Is this application "major" as defined in §1.929 of the Commission's Rules when read in conjunction with the applicable radio service rules found in Parts 22 and 90 of the Commission's Rules? (NOTE: This question only applies to certain site-specific applications. See the instructions for applicability and full text of §1.929).	() <u>Yes</u> <u>No</u>
8) Are attachments (other than associated schedules) being filed with this application?	(Y) <u>Yes</u> <u>No</u>

Fees, Waivers, and Exemptions

9) Is the Applicant exempt from FCC application fees?	(N) <u>Yes</u> <u>No</u>
10) Is the Applicant exempt from FCC regulatory fees?	() <u>Yes</u> <u>No</u>
11a) Does this application include a request for a Waiver of the Commission's Rule(s)? If 'Yes', attach an exhibit providing rule number(s) and explaining circumstances.	(N) <u>Yes</u> <u>No</u>
11b) If 11a is 'Y', enter the number of rule sections involved.	Number of Rule Section(s):
12) Are the frequencies or parameters requested in this filing covered by grandfathered privileges, previously approved by waiver, or functionally integrated with an existing station?	() <u>Yes</u> <u>No</u>

Applicant Information

13) FCC Registration Number (FRN): 0003290673			
14) Applicant/Licensee legal entity type: (Select One.) <input type="checkbox"/> Individual <input type="checkbox"/> Corporation <input type="checkbox"/> Unincorporated Association <input type="checkbox"/> Trust <input type="checkbox"/> Government Entity <input type="checkbox"/> Consortium <input checked="" type="checkbox"/> General Partnership <input type="checkbox"/> Limited Liability Company <input type="checkbox"/> Limited Liability Partnership <input type="checkbox"/> Limited Partnership <input type="checkbox"/> Other (Description of Legal Entity) _____			
15) If the licensee name is being updated, is the update a result from the sale (or transfer of control) of the license(s) to another party and for which proper Commission approval has not been received or proper notification not provided?			() <u>Yes</u> <u>No</u>
16) First Name (if individual):	MI:	Last Name:	Suffix:
17) Legal Entity Name (if other than individual): Cellco Partnership			
18) Attention To: Regulatory			
19) P.O. Box:	And/Or	20) Street Address: 1120 Sanctuary Pkwy, #150 GASA5REG	
21) City: Alpharetta	22) State: GA	23) Zip Code: 30009-7630	
24) Telephone Number: (770)797-1070		25) FAX: (770)797-1036	
26) E-Mail Address: LicensingCompliance@VerizonWireless.com			

27) Demographics (Optional):

Race: <input type="checkbox"/> American Indian or Alaska Native <input type="checkbox"/> Asian <input type="checkbox"/> Black or African-American <input type="checkbox"/> Native Hawaiian or Other Pacific Islander <input type="checkbox"/> White	Ethnicity: <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> Not Hispanic or Latino	Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female
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Real Party in Interest

28) Name of Real Party in Interest of Applicant (If different from applicant):	29) FCC Registration Number (FRN) of Real Party in Interest:
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Contact Information (If different from the applicant)

30) First Name: Licensing	MI: -	Last Name: Manager	Suffix:
31) Company Name: Verizon Wireless			
32) Attention To: Regulatory			
33) P.O. Box:	And /Or	34) Street Address: LicensingCompliance@VerizonWireless.com	
35) City: Alpharetta	36) State: GA	37) Zip Code: 30009-7630	
38) Telephone Number: (770)797-1070		39) FAX: (770)797-1036	
40) E-Mail Address: LicensingCompliance@VerizonWireless.co			

Regulatory Status

41) This filing is for authorization to provide or use the following type(s) of radio service offering (enter all that apply):	
(<input type="checkbox"/>)Common Carrier	(<input type="checkbox"/>)Non-Common Carrier
(<input type="checkbox"/>)Private, internal communications	(<input type="checkbox"/>)Broadcast Services
(<input type="checkbox"/>)Band Manager	

Type of Radio Service

42) This filing is for authorization to provide the following type(s) of radio service (choose all that apply):	
(<input type="checkbox"/>)Fixed	(<input type="checkbox"/>)Mobile
(<input type="checkbox"/>)Radiolocation	(<input type="checkbox"/>)Satellite (sound)
(<input type="checkbox"/>)Broadcast Services	
43) Does the Applicant propose to provide service interconnected to the public telephone network? (<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No	

Alien Ownership Questions (If any answer is 'Y', provide an attachment explaining the circumstances)

44) Is the Applicant a foreign government or the representative of any foreign government?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
45) Is the Applicant an alien or the representative of an alien?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
46) Is the Applicant a corporation organized under the laws of any foreign government?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
47) Is the Applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
48a) Is the Applicant directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof, or by any corporation organized under the laws of a foreign country?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
48b) If the answer to 48a is 'Y', has the Applicant received a ruling(s) under Section 310(b)(4) of the Communications Act with respect to the same radio service involved in this application?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
<p>If the answer to 48b is 'Y', include in the exhibit required by Item 48a the citation(s) of the applicable declaratory ruling(s) by DA/FCC number of the FCC Record citation, if available, release date, and any other identifying information.</p> <p>If the answer to 48b is 'N', attach to this filing a date-stamped copy of a request for a foreign ownership ruling pursuant to Section 310(b)(4) of the Communications Act. It is not necessary to file a request for a foreign ownership ruling if the Applicant includes in the exhibit required by Item 48a a showing that the requested license(s) is exempt from the provisions of Section 310(b)(4).</p>	

Basic Qualification Questions

49) Has the Applicant or any party to this application had any FCC station authorization, license or construction permit revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
50) Has the Applicant or any party to this application, or any party directly or indirectly controlling the Applicant, ever been convicted of a felony by any state or federal court?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
51) Has any court finally adjudged the Applicant or any party directly or indirectly controlling the Applicant guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement, or any other means or unfair methods of competition?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
If the answer to any of 49-51 is 'Y', attach an exhibit explaining the circumstances.	

Aeronautical Advisory Station (Unicom) Certification

52) (<input type="checkbox"/>) I certify that the station will be located on property of the airport to be served, and, in cases where the airport does not have a control tower, RCO, or FAA flight service station, that I have notified the owner of the airport and all aviation service organizations located at the airport within ten days prior to application.

Broadband Radio Service and Educational Broadband Service Cable Cross-Ownership

53a) Will the requested facilities be used to provide multichannel video programming service?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
53b) If the answer to question 53a is 'Y', does the Applicant operate, control or have an attributable interest (as defined in Section 27.1202 of the Commission's Rules) in a cable television system whose franchise area is located within the geographic service area of the requested facilities?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
Note: If the answer to question 53b is 'Y', attach an exhibit explaining how the Applicant complies with Section 27.1202 of the Commission's Rules or justifying a waiver of that rule. If a waiver of the Commission Rule(s) is being requested, Item 11a must be answered 'Y'.	

Broadband Radio Service and Educational Broadband Service (Part 27)

54) (For EBS only) Does the Applicant comply with the programming requirements contained in Section 27.1203 of the Commission's Rules?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
Note: If the answer to item 54 is 'N', attach an exhibit explaining how the Applicant complies with Section 27.1203 of the Commission's Rules or justifying a waiver of that rule. If a waiver of the Commission Rule(s) is being requested, Item 11a must be answered 'Y'.	
55) (For BRS and EBS) Does the Applicant comply with Sections 27.50, 27.55, and 27.1221 of the Commission's Rules?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
Note: If the answer to item 55 is 'N', attach an exhibit justifying a waiver of that rule(s). If a waiver of the Commission Rule(s) is being requested, Item 11a must be answered 'Y'.	

General Certification Statements

1)	The applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application.
2)	The applicant certifies that grant of this application would not cause the applicant to be in violation of any pertinent cross-ownership or attribution rules.* *If the applicant has sought a waiver of any such rule in connection with this application, it may make this certification subject to the outcome of the waiver request.
3)	The applicant certifies that all statements made in this application and in the exhibits, attachments, or documents incorporated by reference are material, are part of this application, and are true, complete, correct, and made in good faith.
4)	The applicant certifies that neither the applicant nor any other party to the application is subject to a denial of Federal benefits pursuant to §5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. § 862, because of a conviction for possession or distribution of a controlled substance. This certification does not apply to applications filed in services exempted under §1.2002(c) of the rules, 47 CFR § 1.2002(c). See §1.2002(b) of the rules, 47 CFR § 1.2002(b), for the definition of "party to the application" as used in this certification.
5)	The applicant certifies that it either (1) has current required ownership data on file with the Commission, (2) is filing updated ownership data simultaneously with this application, or (3) is not required to file ownership data under the Commission's rules.
6)	The applicant certifies that the facilities, operations, and transmitters for which this authorization is hereby requested are either: (1) categorically excluded from routine environmental evaluation for RF exposure as set forth in 47 C.F.R. 1.1307(b); or, (2) have been found not to cause human exposure to levels of radiofrequency radiation in excess of the limits specified in 47 C.F.R. 1.1310 and 2.1093; or, (3) are the subject of one or more Environmental Assessments filed with the Commission.
7)	The applicant certifies that it has reviewed the appropriate Commission rules defining eligibility to hold the requested license(s), and is eligible to hold the requested license(s).
8)	The applicant certifies that it is not in default on any payment for Commission licenses and that it is not delinquent on any non-tax debt owed to any federal agency.

Signature

56) Typed or Printed Name of Party Authorized to Sign

First Name: Steven	MI: A	Last Name: Regitz	Suffix:
57) Title: Authorized Representative			
Signature: Steven A Regitz			58) Date: 06/28/2013
FAILURE TO SIGN THIS APPLICATION MAY RESULT IN DISMISSAL OF THE APPLICATION AND FORFEITURE OF ANY FEES PAID.			
Upon grant of this license application, the licensee may be subject to certain construction or coverage requirements. Failure to meet the construction or coverage requirements will result in termination of the license. Consult appropriate FCC regulations to determine the construction or coverage requirements that apply to the type of license requested in this application.			
WILLFUL FALSE STATEMENTS MADE ON THIS FORM OR ANY ATTACHMENTS ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. Code, Title 18, §1001) AND/OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION PERMIT (U.S. Code, Title 47, §312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, §503).			

**FCC 601
Schedule K**

**Schedule for
Required Notifications for Wireless Services**

Approved by OMB
3060 – 0798
See 601 Main Form
Instructions
For public burden estimate

1) Purpose

The purpose of this submission: Enter one purpose only - 1, 2, 3, 4, I, S, D, G or H (1) See below and refer to instructions.

Satisfaction of Buildout/Coverage Requirements (Market-based services and State License Radio Service (SL) only)

- 1 1st buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- 2 2nd buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- 3 3rd buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- 4 4th buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- I Tribal lands buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)

Satisfaction of Construction Requirements (Site-licensed services only)

- S Construction requirements for the referenced parameters have been met. (List, as applicable, call signs, locations or paths, frequencies, actual date of construction and mobile units in Item 2.)

Request for Regular Authorization for Facilities Operating under Developmental Authority (Paging services only)

- D Notification to request regular authorization for facilities previously operating under developmental authority. (List, as applicable, call signs, locations, frequencies and actual date of construction in Item 2.)

Extended Implementation (Slow Growth) (Land Mobile Services only)

- G Notification of compliance with yearly station construction commitments for licensees with approved extended implementation plans. (List call signs in Item 2a.)
- H Final notification that construction requirements have been met for the referenced system with approved extended implementation plan. (List, as applicable, call signs, locations, frequencies, actual date of construction and mobile units in Item 2.)

2) Call Signs/Locations or Paths/Frequencies

2a) Call Sign	2b) Location Number	2c) Path Number (Microwave only)	2d) Center (Assigned) or Lower Frequency (MHz)	2e) Upper Frequency (MHz)	2f) Actual Date of Construction (mm/dd/yy)	2g) Number of Operational Mobiles (see instructions)
WQJQ730						

3) Certification

By signing the Main Form, the applicant certifies, as set forth in 47 C.F.R. §1.946(c) of the Commission's rules, that it has commenced service or operations by the expiration of its construction period, or met its coverage or substantial service obligations by the expiration of its coverage period.

Attachment(s):

Type	Description	Date Entered
O	<u>Map Exhibit</u>	06/28/2013
O	<u>Narrative Engineering Exhibit</u>	06/28/2013

700 MHz CONSTRUCTION NOTIFICATION

Licensee: Cellco Partnership
Call Sign: WQJQ730
Grant Date: 11/26/2008
Market: Youngstown-Warren, OH
Frequency Block: B

Pursuant to Section 27.14 of the Commission's Rules, Cellco Partnership d/b/a Verizon Wireless ("Cellco"), hereby gives notice of and demonstrates satisfaction of the four-year construction requirement for the license. Section 27.14(g) requires lower 700 MHz Block B licensees to provide signal coverage and offer service over at least 35% of the service area for this license (the "Licensed Area") no later than June 13, 2013. Section 27.14(k) of the Commission's rules require licensees to demonstrate compliance with the performance benchmark by filing a construction notification no later than 15 days after the build-out deadline.

Background

Cellco acquired this 700 MHz B Block license and others at auction. As discussed in greater detail below, Cellco engaged in meaningful efforts in anticipation of bringing the spectrum into use, including designing the network, both in terms of its technical configuration and location of cell sites, and worked with vendors to develop both network equipment and customer devices. Ultimately, Cellco determined that AWS is the most cost-effective and spectrally efficient way for Verizon Wireless to supplement its Upper C Block spectrum in order to provide capacity for growth in customers' use of LTE." It thus chose to sell the 700 MHz B Block licenses as part of a series of recent transactions in which Verizon Wireless has acted to rationalize its spectrum holdings.

Cellco has contracted to transfer its remaining 700 MHz B Block licenses to an affiliate of AT&T ("AT&T") and pending Commission approval of that transfer, has leased the spectrum to AT&T. Pursuant to Section 1.9020(d)(5)(i) of the Commission's rules, Cellco may attribute to itself the build out or performance activities of its spectrum lessee for purposes of complying with the build out requirement. Accordingly, this exhibit is based, in large part, upon information from AT&T and all information as to coverage is based upon AT&T's network deployment pursuant to the lease.

As shown herein, Cellco has satisfied its four-year construction requirement by relying on its lessee's activities in providing signal coverage and offering service over more than 35% of the Licensed Area.

Build Showing

The Licensed Area extends over 1018 square miles (after excluding any Government Lands without coverage). As of the date of this filing, coverage is provided and service is offered within 377 square miles (37%) of that Licensed Area. A coverage map providing a visual

representation of the areas where AT&T is providing coverage and service is included with this performance showing. The level of coverage and service may increase through the deployment of additional facilities before the build-out deadline. The calculations and methodology described below provide the engineering justification to support this build performance showing.

Downlink (“DL”) Signal Level

Mobile voice and data services are being provided in the Licensed Area using the long term evolution (“LTE”) air interface at a minimum signal level of -90 dBm for both 5 MHz x 5 MHz deployments (B Block only) and 10 MHz x 10 MHz (when combined with an AT&T C Block license) deployments. This -90 dBm signal level corresponds to the “total” Reference Signal (“RS”) power, which is related to the more commonly specified Reference Signal Received Power (“RSRP”). Table 1 demonstrates the relationship between the RS and the RSRP. RSRP is measured on a per Resource Element (“RE”) basis where the RE corresponds to a single orthogonal frequency-division multiplexing (“OFDM”) sub-carrier with 15 kHz bandwidth. To convert to total RS power the RSRP per RE must be multiplied by the total number of REs allocated to RSs. Thus, although RSRP per RE is 3 dB lower for a 10 MHz x 10 MHz deployment than for a 5 MHz x 5 MHz deployment, there are twice as many REs or sub-carriers allocated to RSs for a 10 MHz x 10 MHz deployment, effectively offsetting the 3 dB difference in power per RE. This analysis assumes equal total transmit power for a 5 MHz x 5 MHz deployment and a 10 MHz x 10 MHz deployment.

Table 1. AT&T’s Derivation of RSRP per RE from total RS power.

Parameter	5x5 MHz	10x10 MHz	Comment
Total RS power, dBm	-90	-90	Summation of power of all REs that carry RSs.
Terminal loss, dB	-5	-5	Typical terminal antenna gain at lower 700 MHz. This loss must be included since it is not included in the total RS power calculation.
Service body loss, dB	-1	-1	Typical body loss for data card. This loss must be included since it is not included in the total RS power calculation.
Total RS power at Rx antenna port, dBm	-96	-96	Summation of above quantities.
Number of REs allocated to RS in dB	17	20	In OFDM symbols that carry the RS 50 REs are allocated for 5 MHz and 100 REs are allocated for 10 MHz .
RSRP per RE, dBm	-113	-116	Total RS power at Rx antenna port (-96) in dBm minus the number of REs allocated to RS in dB (17 or 20).

The resulting DL throughput that can be supported based upon the above total RS and RSRP per RE is a function of the Signal to Interference plus Noise Ratio (“SINR”) on the Physical Downlink Shared Channel (“PDSCH”), and the number of Resource Blocks (“RBs”) allocated to

a user. For a LTE network, a RB is defined as 12 REs in the frequency dimension and 7 OFDM symbols in the time dimension, corresponding to a time duration of 0.5 milliseconds (“ms”). An RB-pair spans what is referred to as a sub-frame, which is 1 ms in duration, and is the smallest interval over which data can be scheduled. Table 2 calculates the received SINRs for a 5 MHz x 5 MHz deployment and for a 10 MHz x 10 MHz deployment, and the resulting number of RBs required to support at least 1 and 2 Mbps, respectively.

As shown in Table 2, the SINR is the ratio of the received PDSCH signal power over the summation of the interference plus noise, where each figure in this ratio is calculated on a per RE basis. The PDSCH per RE is equal to the RSRP per RE, even though this LTE deployment uses a 3 dB RS power boost since at the cell edge, which is the area of interest, the transmit diversity mode is enabled for the PDSCH, which implies that the same data is transmitted in both transmit paths (spatial multiplexing is not enabled). The effect of this at the terminal receiver is a factor of two power combining gain for the PDSCH, which offsets the 3 dB RS power boost. The RSRP does not realize this power combining gain since to prevent serving cell RS-to-RS interference at the receiver, the REs carrying RSs in transmit path 1 are different from the REs carrying RSs in transmit path 2.

The interference calculated is due solely to the RS interference from the other cells where the interfering RSRP levels are assumed to be the same as the serving cell: -113 dBm for 5 MHz x 5 MHz deployments and -116 dBm for 10 MHz x 10 MHz deployments. These latter values are suitably adjusted by the cell geometry (also referred to as the Carrier to Interference Ratio), and other factors, including multiplication by the ratio of the total number of REs used for RS in a sub-frame to the total number of REs per sub-frame. This latter factor converts the RS interference from an instantaneous power level to an average power level over the sub-frame. The interference term does not include any interference due to the PDSCH in other cells, which is consistent with the assumption of a zero data loading condition.

The resultant SINRs, including a conservative implementation margin of 3 dB, are shown in Table 2 as 1.8 and 0.5 dB for 5 MHz x 5 MHz deployments and 10 MHz x 10 MHz deployments, respectively. Link level performance curves are then used to determine the resulting bit rates per RB for each SINR, which are shown as 0.132 and 0.109 Mbps, respectively for the link level assumptions stated. Thus, to support at least 1 Mbps in 5 MHz x 5 MHz deployments will require 8 RBs, and to support at least 2 Mbps in 10 MHz x 10 MHz deployments will require 19 RBs. Since there are 25 and 50 total RBs for 5 MHz x 5 MHz deployments and 10 MHz x 10 MHz deployments the above throughputs are supported. Since RB allocations are in integer values, the values calculated by dividing the target throughputs by the bit rate per RB are rounded up to the next highest integer. Thus, the actual throughputs turn out to be slightly greater than the target values. If fewer RBs are allocated, the throughput is decreased, and conversely, if more RBs are allocated, the throughput is increased. As the load increases in the network, the throughput will decrease, but this can be offset somewhat by allocating more RBs up to the maximum available. In addition, there is nothing to preclude allocating all of the available RBs to a given user particularly in initial deployments with no or very light loading. In Monte Carlo simulations using the Atoll RF planning tool, it was shown that in a couple of representative markets with 1 to 2 users randomly distributed in each sector

corresponding to a relatively low load that the resulting user throughput for a 5 MHz channel bandwidth was in the range of 1.7 to 2 Mbps at an RSRP per RE = PDSCH per RE = -113 dBm. These simulations assumed that the users had access to all of the available RBs. An approximate doubling of this throughput is estimated for a 10 MHz x 10 MHz deployment.

Table 2 also calculates the total PDSCH signal power for the RB allocations shown to be -93.2 and -92.4 dBm respectively for 5 MHz x 5 MHz deployments and 10 MHz x 10 MHz deployments. These values represent the actual signal power that the terminal receiver has to work with to recover the transmitted data stream. Although it is often convenient to do calculations on a per RE basis, the receiver processes the total signal power.

Table 2. AT&T's Derivation of SINR, number of RBs required and total PDSCH power.

Parameter	5 MHz	10 MHz	Comment
Received average power of PDSCH per RE, dBm	-113	-116	PDSCH per RE is equal to RSRP per RE since 3 dB RS power boost is countered by 3 dB power combining gain of PDSCH when in transmit diversity mode at cell edge.
Receive thermal noise power per RE, dBm	-122.2	-122.2	Calculated in the RE bandwidth of 15 kHz with a 10 dB terminal noise figure.
Interference power per RE, dBm	-119.8	-122.8	In this analysis the interference is restricted to the RS interference from other cells assuming (1) a 95 th percentile cell geometry value of -2.2 dB; (2) an instantaneous to average power conversion factor of about -11.7 dB, and (3) RSRP values before adjustment of -113 and -116 dBm for 5 and 10 MHz.
"Interference plus Noise" per RE, dBm	-117.8	-119.5	Linear addition of interference and noise.
Received SINR, dB	4.8	3.5	PDSCH per RE minus "Interference plus Noise" per RE.
Implementation margin, dB	3	3	Margin to account for any additional losses not considered.
Received SINR with implementation margin, dB	1.8	0.5	Received SINR minus implementation margin.
Bit rate per RB, Mbps	0.132	0.109	Key link level assumptions include: (1) MIMO mode = transmit diversity; (2) Extended Pedestrian A (EPA) channel model with 5 Hz Doppler frequency; and (3) maximum of 4 HARQ transmissions.
Number of RBs required	8	19	Number of RBs required to support at least 1 and 2 Mbps. Since allocations are in integer number of RBs the respective values calculated by dividing the throughputs by the bit rate per RB are rounded up to the next

			highest number.
Actual throughput supported, Mbps	1.06	2.07	Bit rate per RB times number of RBs.
Number of REs allocated to PDSCH in dB	19.8	23.6	8*12 = 96 REs for 5 MHz, 19*12 = 228 REs for 10 MHz.
Total received PDSCH signal power, dBm	-93.2	-92.4	Summation of PDSCH per RE and number of REs allocated to PDSCH.

AT&T's Uplink ("UL") Target Data Rates

The target data rates (i.e. throughputs) that can be supported on the LTE UL are a function of the Maximum Allowable Path Loss (MAPL) that can be supported on the DL, which is based upon a DL signal level corresponding to a total RS power of -90 dBm as defined above. As shown in Table 3 below, the MAPL that corresponds to a -90 dBm total RS power is 104.1 dB for both 5 MHz x 5 MHz and 10 MHz x 10 MHz deployments. Even though the RS Energy per Resource Element (EPRE) for a 5 MHz x 5 MHz (23 dBm) is greater than for a 10 MHz x 10 MHz (20 dBm) deployment (see row 4), the total RS power for each of the two transmit paths for both bandwidth allocations are equivalent and equal to 40 dBm because the number of REs allocated to 10 MHz is twice that allocated to 5 MHz (100 REs compared to 50 REs; see row 5).

Table 3. AT&T's Derivation of Maximum Allowable Path Loss (MAPL) (All calculations are in dBs).

Parameter	5 MHz x5 MHz	10 MHz x10 MHz	Comment
Transmit power per transmit path, dBm	44.77	44.77	30 watts of transmit power for each of two transmit paths (total 60 watts). Our current LTE deployment is based upon two transmit paths at the base station and the same total power for both bandwidth allocations.
Total number of subcarriers in dB	24.77	27.77	300 subcarriers for 5 MHz x 5 MHz 600 subcarriers for 10 MHz x 10 MHz
Reference Signal (RS) power boost, dB	3	3	Resource Elements (REs) allocated to RS are given 3 dB more power than REs allocated to data traffic
RS Energy Per RE (EPRE) per transmit path, dBm	23	20	Transmit power minus total number of subcarriers plus RS power boost
Number of REs allocated to RS in dB	17	20	In OFDM symbols that carry the RS, 50 REs are allocated for 5 MHz x 5 MHz, and 100 REs are allocated for 10 MHz x 10 MHz
Total RS power for each transmit path,	40	40	RS EPRE plus number of REs allocated to RS

dBm			
Base station antenna gain, dBi	14.8	14.8	Antenna gain representative of a 6 foot dual-polarized antenna at 700 MHz
Cable loss, dB	0.5	0.5	This loss is based upon Remote Radio Head (RRH) located at tower top thus minimizing cable length
Total RS transmit EIRP, dBm	54.3	54.3	Total RS power plus base station antenna gain minus cable loss
Shadowing margin, dB	7.3	7.3	Based upon shadowing margin standard deviation of 7 dB for rural environment and 95% cell area coverage probability
Best server selection gain, dB	3.1	3.1	A mobile at cell edge can handover to a neighbor cell with more favorable shadowing
Total RS power signal level, dBm	-90	-90	Coverage signal level defined above
MAPL, dB	140.1	140.1	Total RS transmit EIRP minus shadowing margin plus best server selection gain minus total RS power signal level

An UL link budget is used to determine the UL throughput that can be supported based upon a MAPL of 140.1 dB. Table 4 summarizes the link budget analyses for 128 kbps and 256 kbps UL data service. As shown in Table 4, the resulting MAPLs for no loading (interference margin = 0 dB) are 143.5 dB for 128 kbps and 140.3 dB for 256 kbps. Using linear extrapolation, the UL throughput supported for a MAPL of 140.1 dB is about 264 kbps, as throughput increases with decreasing MAPL. Assuming an interference margin of 3 dB, which corresponds to 100% loading in a somewhat coverage-limited scenario, the MAPLs for 128 kbps and 256 kbps each decrease by 3 dB to 140.5 dB and 137.3 dB, respectively. Using linear interpolation, the resulting UL throughput for a MAPL of 140.1 dB is about 144 kbps.

Table 4. AT&T's LTE UL link budgets to support 128 and 256 kbps.

Parameter	Units	128 kbps	256 kbps	Comment
Average effective data rate	kbps	128	256	UL throughput supported
Number of Resource Blocks (RBs)		3	4	Close to optimum for specified throughput. There is a trade-off between receiver noise bandwidth and required SINR.
Mobile transmit power	dBm	23	23	Transmit power for LTE mobiles
Mobile antenna gain	dBi	-5	-5	Representative device antenna gain at 700 MHz
Service body loss	dB	1	1	Typical body loss for wireless data card

Mobile transmit EIRP	dBm	17	17	Mobile transmit power plus mobile antenna gain minus service body loss
Receive noise power density	dBm/Hz	-174	-174	Standard noise power spectral density at room temperature
Base station noise figure	dB	2.5	2.5	Typical value for LTE eNodeB
Target UL SINR	dB	-0.4	1.5	Based upon the Extended Vehicular A (EVA) channel model at 3 km/h; 10% Block Error Rate (BLER) for the first HARQ transmission; MCS2 for 128 kbps, MCS5 for 256 kbps.
Base station sensitivity	dBm	-114.6	-111.4	SINR plus receive noise power spectral density plus base station noise figure plus receiver bandwidth, where the latter is equal to number of RBs times 180 kHz.
Base station antenna gain	dBi	14.8	14.8	Antenna gain representative of a 6 foot dual-polarized antenna at 700 MHz
Cable loss	dB	0.5	0.5	This loss is based upon RRH located at tower top thus minimizing cable length
Interference margin	dB	0.0	0.0	No load condition
Frequency selective scheduling gain	dB	1.8	1.8	Gain achieved based upon scheduler being able to select best RBs for a given user
Best server selection gain	dB	3.1	3.1	A mobile at cell edge can handover to a neighbor cell with more favorable shadowing
Shadowing margin	dB	7.3	7.3	Based upon shadowing margin standard deviation of 7 dB for rural environment and 95% cell area coverage probability
MAPL	dB	143.5	140.3	Mobile transmit EIRP minus base station sensitivity plus base station antenna gain minus cable loss minus interference margin plus frequency selective scheduling gain plus best server selection gain minus shadowing margin

In summary, the UL throughput that can be supported ranges from about 144 kbps to about 264 kbps depending on loading. These throughputs are representative of what is achievable in LTE deployments at the cell edge. Note that these values are the same for both 5 MHz x 5 MHz and 10 MHz x 10 MHz deployments, as it has been assumed that the number of RBs allocated is the same for both bandwidths.

AT&T's Conversion of RS to Total Received Signal Power.

The signal level for this license is defined in terms of total RS power. If the Commission seeks to convert the total RS power to the total received signal power, the following conversion chart is provided:

Table 5. Conversion from total RS power to total received signal power.

Parameter	Value	Comment
Total RS power, dBm	-90	Coverage signal level defined above
Ratio of number of REs carrying data to number of REs carrying reference signals, dB	7.8	The number of REs that carry downlink data in OFDM symbols dedicated to data transmission is equal to 300 and 600 for 5 MHz x 5 MHz and 10 MHz x 10 MHz, respectively. The number of REs that carry reference signals in OFDM symbols is equal to 50 and 100 for 5 MHz x 5 MHz and 10 MHz x 10 MHz, respectively. Thus, the ratio is equal to 6 (7.8 dB) for both bandwidth allocations.
RS power boost, dB	3	REs allocated to RS are given 3 dB more power than REs allocated to data traffic
Total received signal power, dBm	-85.2	Total RS power plus ratio defined in second row minus RS power boost. This term does not include any interference or noise power, and is preferred over the Received Signal Strength Indicator (RSSI), which does typically include the interference and noise power.

AT&T's Coverage and Service Area Prediction Tool

The distance to contours for each lower 700 MHz site is calculated using network design and analysis propagation models. These propagation models are based on the COST-231 Hata model, defined as follows:

$$L = 46.3 + 33.9\log(f) - 13.82\log(H_b) - a(H_m) + [44.9 - 6.55\log(H_b)]\log(d) + C$$

where

$$a(H_m) = (1.1\log(f) - 0.7)H_m - (1.56\log(f) - 0.8)$$

AT&T's Calculation of Geographic Area of Licensed Area and Coverage/Service

The license build performance under Commission rule Section 27.14(g) (i.e. where coverage is provided and service offered) can be determined using the formula,

$$\frac{\text{Covered Licensed Area (sq. mi.)}}{\text{Modified Licensed Area (sq. mi.)}}$$

where:

- Licensed Area = The number of square miles within the licensed service area as generated by Alteryx, a data compiling, analysis, and reporting tool that can conduct spatial calculations, including distances in square miles between set boundaries. Lands

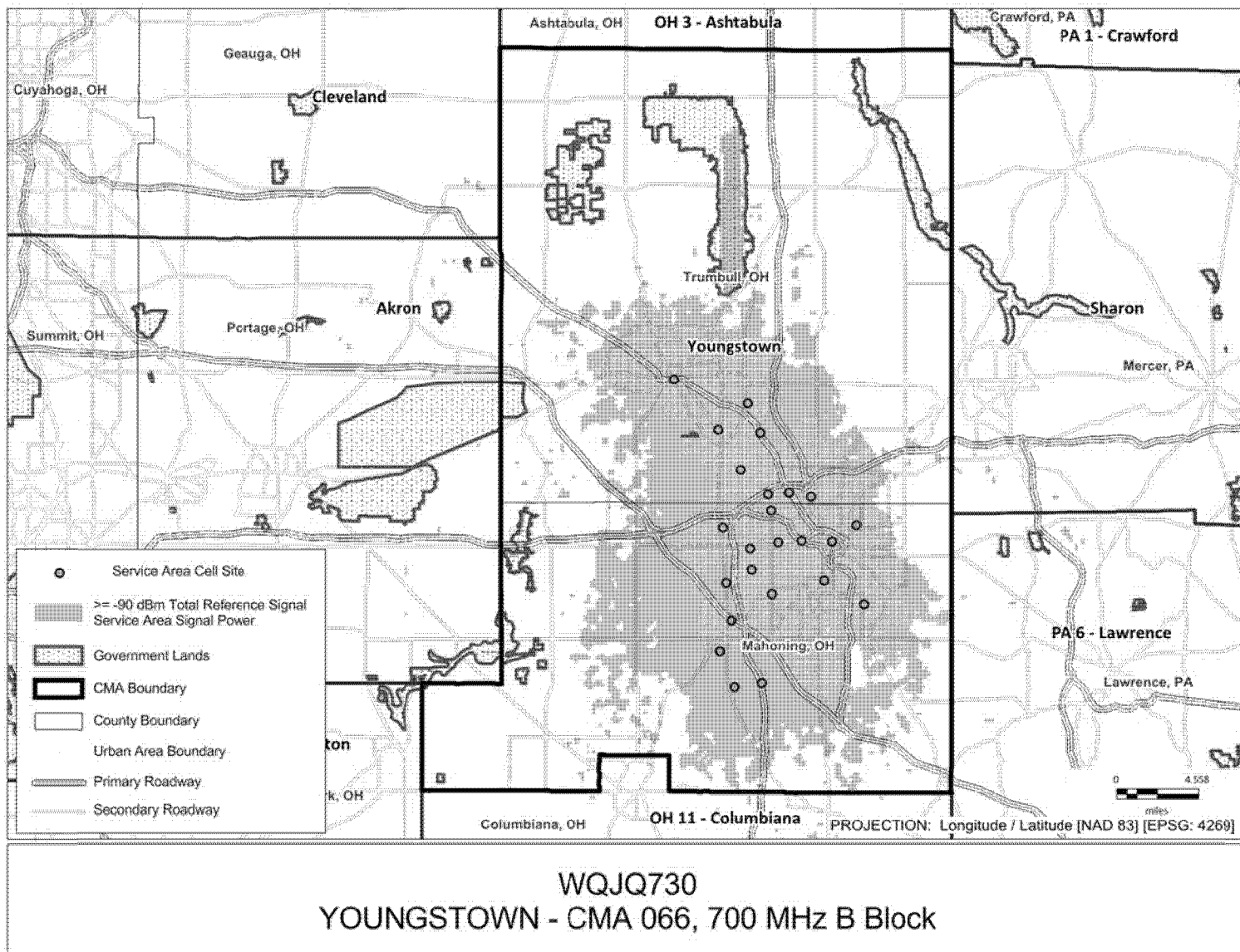
owned by tribal governments and lands held by the Federal Government in trust or for the benefit of a recognized tribe are included in the Licensed Area.

- Covered Licensed Area = The total geographic area within the Licensed Area where coverage is provided and service offered.
- Modified Licensed Area = The Licensed Area minus the geographic area within the Licensed Area that is Government Lands where coverage is provided and service offered.
- Government Lands = Areas that are owned or administered by Federal Government agencies and entities and areas that are owned or managed by States, as explained by Commission Order.¹ The geographic area (sq. mi.) comprising Government Lands was generated based on data from NationalAtlas.com for Federal lands and from the State Parks files in StreetPro and/or the GeoSpatial Data Gateway of the United States Department of Agriculture, National Resources Conservation Service, for State lands. For this license, Government Lands comprising 4.1% of the Licensed Area were excluded from the Licensed Area.

Conclusion

Using the methodologies above as provided by AT&T, coverage is provided and service offered in an area in excess of the 35% performance benchmark.

¹ See Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, *Second Report and Order* at 67 (2007).



Reference Copy Only. Do Not Mail to the FCC as an Application.

Submitted: 06/28/2013 at 16:39:54
File Number: 0005839391

FCC 601
Main Form

FCC Application for Radio Service Authorization: Wireless Telecommunications Bureau Public Safety and Homeland Security Bureau

Approved by OMB
3060 - 0798
See instructions for
public burden estimate

1) Radio Service Code: WY	1a) Existing Radio Service Code:
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General Information

2) (Select only one) (NT) NE - New RO - Renewal Only AU - Administrative Update NT - Required Notifications MD - Modification RM - Renewal/Modification WD - Withdrawal of Application EX - Requests for Extension of Time AM - Amendment CA - Cancellation of License DU - Duplicate License RL - Registered Location/Link	
3a) If this application is for a <u>D</u> evelopmental License, <u>D</u> emonstration License, or a <u>S</u> pecial Temporary Authorization (STA), enter the code and attach the required exhibit as described in the instructions. Otherwise enter ' <u>N</u> ' (Not Applicable).	(N) <u>D</u> <u>M</u> <u>S</u> <u>N/A</u>
3b) If this application is for Special Temporary Authority due to an emergency situation, enter 'Y'; otherwise enter 'N'. Refer to Rule 1.915 for an explanation of situations considered to be an emergency.	() <u>Yes</u> <u>No</u>
4) If this application is for an Amendment or Withdrawal, enter the file number of the pending application currently on file with the FCC.	File Number
5) If this application is for a Modification, Renewal Only, Renewal/Modification, Cancellation of License, Duplicate License, or Administrative Update, enter the call sign of the existing FCC license. If this is a request for Registered Location/Link, enter the FCC call sign assigned to the geographic license.	Call Sign
6) If this application is for a New, Amendment, Renewal Only, or Renewal/Modification, enter the requested authorization expiration date (this item is optional).	MM DD /
7) Is this application "major" as defined in §1.929 of the Commission's Rules when read in conjunction with the applicable radio service rules found in Parts 22 and 90 of the Commission's Rules? (NOTE: This question only applies to certain site-specific applications. See the instructions for applicability and full text of §1.929).	() <u>Yes</u> <u>No</u>
8) Are attachments (other than associated schedules) being filed with this application?	(Y) <u>Yes</u> <u>No</u>

Fees, Waivers, and Exemptions

9) Is the Applicant exempt from FCC application fees?	(N) <u>Yes</u> <u>No</u>
10) Is the Applicant exempt from FCC regulatory fees?	() <u>Yes</u> <u>No</u>
11a) Does this application include a request for a Waiver of the Commission's Rule(s)? If 'Yes', attach an exhibit providing rule number(s) and explaining circumstances.	(N) <u>Yes</u> <u>No</u>
11b) If 11a is 'Y', enter the number of rule sections involved.	Number of Rule Section(s):
12) Are the frequencies or parameters requested in this filing covered by grandfathered privileges, previously approved by waiver, or functionally integrated with an existing station?	() <u>Yes</u> <u>No</u>

Applicant Information

13) FCC Registration Number (FRN): 0003290673			
14) Applicant/Licensee legal entity type: (Select One.) <input type="checkbox"/> Individual <input type="checkbox"/> Corporation <input type="checkbox"/> Unincorporated Association <input type="checkbox"/> Trust <input type="checkbox"/> Government Entity <input type="checkbox"/> Consortium <input checked="" type="checkbox"/> General Partnership <input type="checkbox"/> Limited Liability Company <input type="checkbox"/> Limited Liability Partnership <input type="checkbox"/> Limited Partnership <input type="checkbox"/> Other (Description of Legal Entity) _____			
15) If the licensee name is being updated, is the update a result from the sale (or transfer of control) of the license(s) to another party and for which proper Commission approval has not been received or proper notification not provided?			() <u>Yes</u> <u>No</u>
16) First Name (if individual):	MI:	Last Name:	Suffix:
17) Legal Entity Name (if other than individual): Cellco Partnership			
18) Attention To: Regulatory			
19) P.O. Box:	And/Or	20) Street Address: 1120 Sanctuary Pkwy, #150 GASA5REG	
21) City: Alpharetta	22) State: GA	23) Zip Code: 30009-7630	
24) Telephone Number: (770)797-1070		25) FAX: (770)797-1036	
26) E-Mail Address: LicensingCompliance@VerizonWireless.com			

27) Demographics (Optional):

Race: <input type="checkbox"/> American Indian or Alaska Native <input type="checkbox"/> Asian <input type="checkbox"/> Black or African-American <input type="checkbox"/> Native Hawaiian or Other Pacific Islander <input type="checkbox"/> White	Ethnicity: <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> Not Hispanic or Latino	Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female
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Real Party in Interest

28) Name of Real Party in Interest of Applicant (If different from applicant):	29) FCC Registration Number (FRN) of Real Party in Interest:
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Contact Information (If different from the applicant)

30) First Name: Licensing	MI: -	Last Name: Manager	Suffix:
31) Company Name: Verizon Wireless			
32) Attention To: Regulatory			
33) P.O. Box:	And /Or	34) Street Address: LicensingCompliance@VerizonWireless.com	
35) City: Alpharetta	36) State: GA	37) Zip Code: 30009-7630	
38) Telephone Number: (770)797-1070		39) FAX: (770)797-1036	
40) E-Mail Address: LicensingCompliance@VerizonWireless.co			

Regulatory Status

41) This filing is for authorization to provide or use the following type(s) of radio service offering (enter all that apply):

(☐) Common Carrier (☐) Non-Common Carrier (☐) Private, internal communications (☒) Broadcast Services (☒) Band Manager

Type of Radio Service

42) This filing is for authorization to provide the following type(s) of radio service (choose all that apply):

(☒) Fixed (☒) Mobile (☒) Radiolocation (☒) Satellite (sound) (☒) Broadcast Services

43) Does the Applicant propose to provide service interconnected to the public telephone network? (☐) Yes ☒ No

Alien Ownership Questions (If any answer is 'Y', provide an attachment explaining the circumstances)

44) Is the Applicant a foreign government or the representative of any foreign government? (☐) Yes ☒ No

45) Is the Applicant an alien or the representative of an alien? (☐) Yes ☒ No

46) Is the Applicant a corporation organized under the laws of any foreign government? (☐) Yes ☒ No

47) Is the Applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country? (☐) Yes ☒ No

48a) Is the Applicant directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof, or by any corporation organized under the laws of a foreign country? (☐) Yes ☒ No

48b) If the answer to 48a is 'Y', has the Applicant received a ruling(s) under Section 310(b)(4) of the Communications Act with respect to the same radio service involved in this application? (☐) Yes ☒ No

If the answer to 48b is 'Y', include in the exhibit required by Item 48a the citation(s) of the applicable declaratory ruling(s) by DA/FCC number of the FCC Record citation, if available, release date, and any other identifying information.

If the answer to 48b is 'N', attach to this filing a date-stamped copy of a request for a foreign ownership ruling pursuant to Section 310(b)(4) of the Communications Act. It is not necessary to file a request for a foreign ownership ruling if the Applicant includes in the exhibit required by Item 48a a showing that the requested license(s) is exempt from the provisions of Section 310(b)(4).

Basic Qualification Questions

49) Has the Applicant or any party to this application had any FCC station authorization, license or construction permit revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission? (☐) Yes ☒ No

50) Has the Applicant or any party to this application, or any party directly or indirectly controlling the Applicant, ever been convicted of a felony by any state or federal court? (☐) Yes ☒ No

51) Has any court finally adjudged the Applicant or any party directly or indirectly controlling the Applicant guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement, or any other means or unfair methods of competition? (☐) Yes ☒ No

If the answer to any of 49-51 is 'Y', attach an exhibit explaining the circumstances.

Aeronautical Advisory Station (Unicom) Certification

52) (☐) I certify that the station will be located on property of the airport to be served, and, in cases where the airport does not have a control tower, RCO, or FAA flight service station, that I have notified the owner of the airport and all aviation service organizations located at the airport within ten days prior to application.

Broadband Radio Service and Educational Broadband Service Cable Cross-Ownership

53a) Will the requested facilities be used to provide multichannel video programming service? (☐) Yes ☒ No

53b) If the answer to question 53a is 'Y', does the Applicant operate, control or have an attributable interest (as defined in Section 27.1202 of the Commission's Rules) in a cable television system whose franchise area is located within the geographic service area of the requested facilities? (☐) Yes ☒ No

Note: If the answer to question 53b is 'Y', attach an exhibit explaining how the Applicant complies with Section 27.1202 of the Commission's Rules or justifying a waiver of that rule. If a waiver of the Commission Rule(s) is being requested, Item 11a must be answered 'Y'.

Broadband Radio Service and Educational Broadband Service (Part 27)

54) (For EBS only) Does the Applicant comply with the programming requirements contained in Section 27.1203 of the Commission's Rules? (☐) Yes ☒ No

Note: If the answer to item 54 is 'N', attach an exhibit explaining how the Applicant complies with Section 27.1203 of the Commission's Rules or justifying a waiver of that rule. If a waiver of the Commission Rule(s) is being requested, Item 11a must be answered 'Y'.

55) (For BRS and EBS) Does the Applicant comply with Sections 27.50, 27.55, and 27.1221 of the Commission's Rules? (☐) Yes ☒ No

Note: If the answer to item 55 is 'N', attach an exhibit justifying a waiver of that rule(s). If a waiver of the Commission Rule(s) is being requested, Item 11a must be answered 'Y'.

General Certification Statements

1)	The applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application.
2)	The applicant certifies that grant of this application would not cause the applicant to be in violation of any pertinent cross-ownership or attribution rules.* *If the applicant has sought a waiver of any such rule in connection with this application, it may make this certification subject to the outcome of the waiver request.
3)	The applicant certifies that all statements made in this application and in the exhibits, attachments, or documents incorporated by reference are material, are part of this application, and are true, complete, correct, and made in good faith.
4)	The applicant certifies that neither the applicant nor any other party to the application is subject to a denial of Federal benefits pursuant to §5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. § 862, because of a conviction for possession or distribution of a controlled substance. This certification does not apply to applications filed in services exempted under §1.2002(c) of the rules, 47 CFR § 1.2002(c). See §1.2002(b) of the rules, 47 CFR § 1.2002(b), for the definition of "party to the application" as used in this certification.
5)	The applicant certifies that it either (1) has current required ownership data on file with the Commission, (2) is filing updated ownership data simultaneously with this application, or (3) is not required to file ownership data under the Commission's rules.
6)	The applicant certifies that the facilities, operations, and transmitters for which this authorization is hereby requested are either: (1) categorically excluded from routine environmental evaluation for RF exposure as set forth in 47 C.F.R. 1.1307(b); or, (2) have been found not to cause human exposure to levels of radiofrequency radiation in excess of the limits specified in 47 C.F.R. 1.1310 and 2.1093; or, (3) are the subject of one or more Environmental Assessments filed with the Commission.
7)	The applicant certifies that it has reviewed the appropriate Commission rules defining eligibility to hold the requested license(s), and is eligible to hold the requested license(s).
8)	The applicant certifies that it is not in default on any payment for Commission licenses and that it is not delinquent on any non-tax debt owed to any federal agency.

Signature

56) Typed or Printed Name of Party Authorized to Sign

First Name: Steven	MI: A	Last Name: Regitz	Suffix:
57) Title: Authorized Representative			
Signature: Steven A Regitz			58) Date: 06/28/2013
FAILURE TO SIGN THIS APPLICATION MAY RESULT IN DISMISSAL OF THE APPLICATION AND FORFEITURE OF ANY FEES PAID.			
Upon grant of this license application, the licensee may be subject to certain construction or coverage requirements. Failure to meet the construction or coverage requirements will result in termination of the license. Consult appropriate FCC regulations to determine the construction or coverage requirements that apply to the type of license requested in this application.			
WILLFUL FALSE STATEMENTS MADE ON THIS FORM OR ANY ATTACHMENTS ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. Code, Title 18, §1001) AND/OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION PERMIT (U.S. Code, Title 47, §312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, §503).			

**FCC 601
Schedule K**

**Schedule for
Required Notifications for Wireless Services**

Approved by OMB
3060 – 0798
See 601 Main Form
Instructions
For public burden estimate

1) Purpose

The purpose of this submission: Enter one purpose only - 1, 2, 3, 4, I, S, D, G or H (1) See below and refer to instructions.

Satisfaction of Buildout/Coverage Requirements (Market-based services and State License Radio Service (SL) only)

- 1 1st buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- 2 2nd buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- 3 3rd buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- 4 4th buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- I Tribal lands buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)

Satisfaction of Construction Requirements (Site-licensed services only)

- S Construction requirements for the referenced parameters have been met. (List, as applicable, call signs, locations or paths, frequencies, actual date of construction and mobile units in Item 2.)

Request for Regular Authorization for Facilities Operating under Developmental Authority (Paging services only)

- D Notification to request regular authorization for facilities previously operating under developmental authority. (List, as applicable, call signs, locations, frequencies and actual date of construction in Item 2.)

Extended Implementation (Slow Growth) (Land Mobile Services only)

- G Notification of compliance with yearly station construction commitments for licensees with approved extended implementation plans. (List call signs in Item 2a.)
- H Final notification that construction requirements have been met for the referenced system with approved extended implementation plan. (List, as applicable, call signs, locations, frequencies, actual date of construction and mobile units in Item 2.)

2) Call Signs/Locations or Paths/Frequencies

2a) Call Sign	2b) Location Number	2c) Path Number (Microwave only)	2d) Center (Assigned) or Lower Frequency (MHz)	2e) Upper Frequency (MHz)	2f) Actual Date of Construction (mm/dd/yy)	2g) Number of Operational Mobiles (see instructions)
WQJQ741						

3) Certification

By signing the Main Form, the applicant certifies, as set forth in 47 C.F.R. §1.946(c) of the Commission's rules, that it has commenced service or operations by the expiration of its construction period, or met its coverage or substantial service obligations by the expiration of its coverage period.

Attachment(s):

Type	Description	Date Entered
O	<u>Map Exhibit</u>	06/28/2013
O	<u>Narrative Engineering Exhibit</u>	06/28/2013

700 MHz CONSTRUCTION NOTIFICATION

Licensee: Cellco Partnership
Call Sign: WQJQ741
Grant Date: 11/26/2008
Market: Fort Collins-Loveland, CO
Frequency Block: B

Pursuant to Section 27.14 of the Commission's Rules, Cellco Partnership d/b/a Verizon Wireless ("Cellco"), hereby gives notice of and demonstrates satisfaction of the four-year construction requirement for the license. Section 27.14(g) requires lower 700 MHz Block B licensees to provide signal coverage and offer service over at least 35% of the service area for this license (the "Licensed Area") no later than June 13, 2013. Section 27.14(k) of the Commission's rules require licensees to demonstrate compliance with the performance benchmark by filing a construction notification no later than 15 days after the build-out deadline.

Background

Cellco acquired this 700 MHz B Block license and others at auction. As discussed in greater detail below, Cellco engaged in meaningful efforts in anticipation of bringing the spectrum into use, including designing the network, both in terms of its technical configuration and location of cell sites, and worked with vendors to develop both network equipment and customer devices. Ultimately, Cellco determined that AWS is the most cost-effective and spectrally efficient way for Verizon Wireless to supplement its Upper C Block spectrum in order to provide capacity for growth in customers' use of LTE." It thus chose to sell the 700 MHz B Block licenses as part of a series of recent transactions in which Verizon Wireless has acted to rationalize its spectrum holdings.

Cellco has contracted to transfer its remaining 700 MHz B Block licenses to an affiliate of AT&T ("AT&T") and pending Commission approval of that transfer, has leased the spectrum to AT&T. Pursuant to Section 1.9020(d)(5)(i) of the Commission's rules, Cellco may attribute to itself the build out or performance activities of its spectrum lessee for purposes of complying with the build out requirement. Accordingly, this exhibit is based, in large part, upon information from AT&T and all information as to coverage is based upon AT&T's network deployment pursuant to the lease.

As shown herein, Cellco has satisfied its four-year construction requirement by relying on its lessee's activities in providing signal coverage and offering service over more than 35% of the Licensed Area.

Build Showing

The Licensed Area extends over 1306 square miles (after excluding any Government Lands without coverage). As of the date of this filing, coverage is provided and service is offered within 545 square miles (42%) of that Licensed Area. A coverage map providing a visual

representation of the areas where AT&T is providing coverage and service is included with this performance showing. The level of coverage and service may increase through the deployment of additional facilities before the build-out deadline. The calculations and methodology described below provide the engineering justification to support this build performance showing.

Downlink (“DL”) Signal Level

Mobile voice and data services are being provided in the Licensed Area using the long term evolution (“LTE”) air interface at a minimum signal level of -90 dBm for both 5 MHz x 5 MHz deployments (B Block only) and 10 MHz x 10 MHz (when combined with an AT&T C Block license) deployments. This -90 dBm signal level corresponds to the “total” Reference Signal (“RS”) power, which is related to the more commonly specified Reference Signal Received Power (“RSRP”). Table 1 demonstrates the relationship between the RS and the RSRP. RSRP is measured on a per Resource Element (“RE”) basis where the RE corresponds to a single orthogonal frequency-division multiplexing (“OFDM”) sub-carrier with 15 kHz bandwidth. To convert to total RS power the RSRP per RE must be multiplied by the total number of REs allocated to RSs. Thus, although RSRP per RE is 3 dB lower for a 10 MHz x 10 MHz deployment than for a 5 MHz x 5 MHz deployment, there are twice as many REs or sub-carriers allocated to RSs for a 10 MHz x 10 MHz deployment, effectively offsetting the 3 dB difference in power per RE. This analysis assumes equal total transmit power for a 5 MHz x 5 MHz deployment and a 10 MHz x 10 MHz deployment.

Table 1. AT&T’s Derivation of RSRP per RE from total RS power.

Parameter	5x5 MHz	10x10 MHz	Comment
Total RS power, dBm	-90	-90	Summation of power of all REs that carry RSs.
Terminal loss, dB	-5	-5	Typical terminal antenna gain at lower 700 MHz. This loss must be included since it is not included in the total RS power calculation.
Service body loss, dB	-1	-1	Typical body loss for data card. This loss must be included since it is not included in the total RS power calculation.
Total RS power at Rx antenna port, dBm	-96	-96	Summation of above quantities.
Number of REs allocated to RS in dB	17	20	In OFDM symbols that carry the RS 50 REs are allocated for 5 MHz and 100 REs are allocated for 10 MHz .
RSRP per RE, dBm	-113	-116	Total RS power at Rx antenna port (-96) in dBm minus the number of REs allocated to RS in dB (17 or 20).

The resulting DL throughput that can be supported based upon the above total RS and RSRP per RE is a function of the Signal to Interference plus Noise Ratio (“SINR”) on the Physical Downlink Shared Channel (“PDSCH”), and the number of Resource Blocks (“RBs”) allocated to

a user. For a LTE network, a RB is defined as 12 REs in the frequency dimension and 7 OFDM symbols in the time dimension, corresponding to a time duration of 0.5 milliseconds (“ms”). An RB-pair spans what is referred to as a sub-frame, which is 1 ms in duration, and is the smallest interval over which data can be scheduled. Table 2 calculates the received SINRs for a 5 MHz x 5 MHz deployment and for a 10 MHz x 10 MHz deployment, and the resulting number of RBs required to support at least 1 and 2 Mbps, respectively.

As shown in Table 2, the SINR is the ratio of the received PDSCH signal power over the summation of the interference plus noise, where each figure in this ratio is calculated on a per RE basis. The PDSCH per RE is equal to the RSRP per RE, even though this LTE deployment uses a 3 dB RS power boost since at the cell edge, which is the area of interest, the transmit diversity mode is enabled for the PDSCH, which implies that the same data is transmitted in both transmit paths (spatial multiplexing is not enabled). The effect of this at the terminal receiver is a factor of two power combining gain for the PDSCH, which offsets the 3 dB RS power boost. The RSRP does not realize this power combining gain since to prevent serving cell RS-to-RS interference at the receiver, the REs carrying RSs in transmit path 1 are different from the REs carrying RSs in transmit path 2.

The interference calculated is due solely to the RS interference from the other cells where the interfering RSRP levels are assumed to be the same as the serving cell: -113 dBm for 5 MHz x 5 MHz deployments and -116 dBm for 10 MHz x 10 MHz deployments. These latter values are suitably adjusted by the cell geometry (also referred to as the Carrier to Interference Ratio), and other factors, including multiplication by the ratio of the total number of REs used for RS in a sub-frame to the total number of REs per sub-frame. This latter factor converts the RS interference from an instantaneous power level to an average power level over the sub-frame. The interference term does not include any interference due to the PDSCH in other cells, which is consistent with the assumption of a zero data loading condition.

The resultant SINRs, including a conservative implementation margin of 3 dB, are shown in Table 2 as 1.8 and 0.5 dB for 5 MHz x 5 MHz deployments and 10 MHz x 10 MHz deployments, respectively. Link level performance curves are then used to determine the resulting bit rates per RB for each SINR, which are shown as 0.132 and 0.109 Mbps, respectively for the link level assumptions stated. Thus, to support at least 1 Mbps in 5 MHz x 5 MHz deployments will require 8 RBs, and to support at least 2 Mbps in 10 MHz x 10 MHz deployments will require 19 RBs. Since there are 25 and 50 total RBs for 5 MHz x 5 MHz deployments and 10 MHz x 10 MHz deployments the above throughputs are supported. Since RB allocations are in integer values, the values calculated by dividing the target throughputs by the bit rate per RB are rounded up to the next highest integer. Thus, the actual throughputs turn out to be slightly greater than the target values. If fewer RBs are allocated, the throughput is decreased, and conversely, if more RBs are allocated, the throughput is increased. As the load increases in the network, the throughput will decrease, but this can be offset somewhat by allocating more RBs up to the maximum available. In addition, there is nothing to preclude allocating all of the available RBs to a given user particularly in initial deployments with no or very light loading. In Monte Carlo simulations using the Atoll RF planning tool, it was shown that in a couple of representative markets with 1 to 2 users randomly distributed in each sector

corresponding to a relatively low load that the resulting user throughput for a 5 MHz channel bandwidth was in the range of 1.7 to 2 Mbps at an RSRP per RE = PDSCH per RE = -113 dBm. These simulations assumed that the users had access to all of the available RBs. An approximate doubling of this throughput is estimated for a 10 MHz x 10 MHz deployment.

Table 2 also calculates the total PDSCH signal power for the RB allocations shown to be -93.2 and -92.4 dBm respectively for 5 MHz x 5 MHz deployments and 10 MHz x 10 MHz deployments. These values represent the actual signal power that the terminal receiver has to work with to recover the transmitted data stream. Although it is often convenient to do calculations on a per RE basis, the receiver processes the total signal power.

Table 2. AT&T's Derivation of SINR, number of RBs required and total PDSCH power.

Parameter	5 MHz	10 MHz	Comment
Received average power of PDSCH per RE, dBm	-113	-116	PDSCH per RE is equal to RSRP per RE since 3 dB RS power boost is countered by 3 dB power combining gain of PDSCH when in transmit diversity mode at cell edge.
Receive thermal noise power per RE, dBm	-122.2	-122.2	Calculated in the RE bandwidth of 15 kHz with a 10 dB terminal noise figure.
Interference power per RE, dBm	-119.8	-122.8	In this analysis the interference is restricted to the RS interference from other cells assuming (1) a 95 th percentile cell geometry value of -2.2 dB; (2) an instantaneous to average power conversion factor of about -11.7 dB, and (3) RSRP values before adjustment of -113 and -116 dBm for 5 and 10 MHz.
"Interference plus Noise" per RE, dBm	-117.8	-119.5	Linear addition of interference and noise.
Received SINR, dB	4.8	3.5	PDSCH per RE minus "Interference plus Noise" per RE.
Implementation margin, dB	3	3	Margin to account for any additional losses not considered.
Received SINR with implementation margin, dB	1.8	0.5	Received SINR minus implementation margin.
Bit rate per RB, Mbps	0.132	0.109	Key link level assumptions include: (1) MIMO mode = transmit diversity; (2) Extended Pedestrian A (EPA) channel model with 5 Hz Doppler frequency; and (3) maximum of 4 HARQ transmissions.
Number of RBs required	8	19	Number of RBs required to support at least 1 and 2 Mbps. Since allocations are in integer number of RBs the respective values calculated by dividing the throughputs by the bit rate per RB are rounded up to the next

			highest number.
Actual throughput supported, Mbps	1.06	2.07	Bit rate per RB times number of RBs.
Number of REs allocated to PDSCH in dB	19.8	23.6	8*12 = 96 REs for 5 MHz, 19*12 = 228 REs for 10 MHz.
Total received PDSCH signal power, dBm	-93.2	-92.4	Summation of PDSCH per RE and number of REs allocated to PDSCH.

AT&T's Uplink ("UL") Target Data Rates

The target data rates (i.e. throughputs) that can be supported on the LTE UL are a function of the Maximum Allowable Path Loss (MAPL) that can be supported on the DL, which is based upon a DL signal level corresponding to a total RS power of -90 dBm as defined above. As shown in Table 3 below, the MAPL that corresponds to a -90 dBm total RS power is 104.1 dB for both 5 MHz x 5 MHz and 10 MHz x 10 MHz deployments. Even though the RS Energy per Resource Element (EPRE) for a 5 MHz x 5 MHz (23 dBm) is greater than for a 10 MHz x 10 MHz (20 dBm) deployment (see row 4), the total RS power for each of the two transmit paths for both bandwidth allocations are equivalent and equal to 40 dBm because the number of REs allocated to 10 MHz is twice that allocated to 5 MHz (100 REs compared to 50 REs; see row 5).

Table 3. AT&T's Derivation of Maximum Allowable Path Loss (MAPL) (All calculations are in dBs).

Parameter	5 MHz x5 MHz	10 MHz x10 MHz	Comment
Transmit power per transmit path, dBm	44.77	44.77	30 watts of transmit power for each of two transmit paths (total 60 watts). Our current LTE deployment is based upon two transmit paths at the base station and the same total power for both bandwidth allocations.
Total number of subcarriers in dB	24.77	27.77	300 subcarriers for 5 MHz x 5 MHz 600 subcarriers for 10 MHz x 10 MHz
Reference Signal (RS) power boost, dB	3	3	Resource Elements (REs) allocated to RS are given 3 dB more power than REs allocated to data traffic
RS Energy Per RE (EPRE) per transmit path, dBm	23	20	Transmit power minus total number of subcarriers plus RS power boost
Number of REs allocated to RS in dB	17	20	In OFDM symbols that carry the RS, 50 REs are allocated for 5 MHz x 5 MHz, and 100 REs are allocated for 10 MHz x 10 MHz
Total RS power for each transmit path,	40	40	RS EPRE plus number of REs allocated to RS

dBm			
Base station antenna gain, dBi	14.8	14.8	Antenna gain representative of a 6 foot dual-polarized antenna at 700 MHz
Cable loss, dB	0.5	0.5	This loss is based upon Remote Radio Head (RRH) located at tower top thus minimizing cable length
Total RS transmit EIRP, dBm	54.3	54.3	Total RS power plus base station antenna gain minus cable loss
Shadowing margin, dB	7.3	7.3	Based upon shadowing margin standard deviation of 7 dB for rural environment and 95% cell area coverage probability
Best server selection gain, dB	3.1	3.1	A mobile at cell edge can handover to a neighbor cell with more favorable shadowing
Total RS power signal level, dBm	-90	-90	Coverage signal level defined above
MAPL, dB	140.1	140.1	Total RS transmit EIRP minus shadowing margin plus best server selection gain minus total RS power signal level

An UL link budget is used to determine the UL throughput that can be supported based upon a MAPL of 140.1 dB. Table 4 summarizes the link budget analyses for 128 kbps and 256 kbps UL data service. As shown in Table 4, the resulting MAPLs for no loading (interference margin = 0 dB) are 143.5 dB for 128 kbps and 140.3 dB for 256 kbps. Using linear extrapolation, the UL throughput supported for a MAPL of 140.1 dB is about 264 kbps, as throughput increases with decreasing MAPL. Assuming an interference margin of 3 dB, which corresponds to 100% loading in a somewhat coverage-limited scenario, the MAPLs for 128 kbps and 256 kbps each decrease by 3 dB to 140.5 dB and 137.3 dB, respectively. Using linear interpolation, the resulting UL throughput for a MAPL of 140.1 dB is about 144 kbps.

Table 4. AT&T's LTE UL link budgets to support 128 and 256 kbps.

Parameter	Units	128 kbps	256 kbps	Comment
Average effective data rate	kbps	128	256	UL throughput supported
Number of Resource Blocks (RBs)		3	4	Close to optimum for specified throughput. There is a trade-off between receiver noise bandwidth and required SINR.
Mobile transmit power	dBm	23	23	Transmit power for LTE mobiles
Mobile antenna gain	dBi	-5	-5	Representative device antenna gain at 700 MHz
Service body loss	dB	1	1	Typical body loss for wireless data card

Mobile transmit EIRP	dBm	17	17	Mobile transmit power plus mobile antenna gain minus service body loss
Receive noise power density	dBm/Hz	-174	-174	Standard noise power spectral density at room temperature
Base station noise figure	dB	2.5	2.5	Typical value for LTE eNodeB
Target UL SINR	dB	-0.4	1.5	Based upon the Extended Vehicular A (EVA) channel model at 3 km/h; 10% Block Error Rate (BLER) for the first HARQ transmission; MCS2 for 128 kbps, MCS5 for 256 kbps.
Base station sensitivity	dBm	-114.6	-111.4	SINR plus receive noise power spectral density plus base station noise figure plus receiver bandwidth, where the latter is equal to number of RBs times 180 kHz.
Base station antenna gain	dBi	14.8	14.8	Antenna gain representative of a 6 foot dual-polarized antenna at 700 MHz
Cable loss	dB	0.5	0.5	This loss is based upon RRH located at tower top thus minimizing cable length
Interference margin	dB	0.0	0.0	No load condition
Frequency selective scheduling gain	dB	1.8	1.8	Gain achieved based upon scheduler being able to select best RBs for a given user
Best server selection gain	dB	3.1	3.1	A mobile at cell edge can handover to a neighbor cell with more favorable shadowing
Shadowing margin	dB	7.3	7.3	Based upon shadowing margin standard deviation of 7 dB for rural environment and 95% cell area coverage probability
MAPL	dB	143.5	140.3	Mobile transmit EIRP minus base station sensitivity plus base station antenna gain minus cable loss minus interference margin plus frequency selective scheduling gain plus best server selection gain minus shadowing margin

In summary, the UL throughput that can be supported ranges from about 144 kbps to about 264 kbps depending on loading. These throughputs are representative of what is achievable in LTE deployments at the cell edge. Note that these values are the same for both 5 MHz x 5 MHz and 10 MHz x 10 MHz deployments, as it has been assumed that the number of RBs allocated is the same for both bandwidths.

AT&T's Conversion of RS to Total Received Signal Power.

The signal level for this license is defined in terms of total RS power. If the Commission seeks to convert the total RS power to the total received signal power, the following conversion chart is provided:

Table 5. Conversion from total RS power to total received signal power.

Parameter	Value	Comment
Total RS power, dBm	-90	Coverage signal level defined above
Ratio of number of REs carrying data to number of REs carrying reference signals, dB	7.8	The number of REs that carry downlink data in OFDM symbols dedicated to data transmission is equal to 300 and 600 for 5 MHz x 5 MHz and 10 MHz x 10 MHz, respectively. The number of REs that carry reference signals in OFDM symbols is equal to 50 and 100 for 5 MHz x 5 MHz and 10 MHz x 10 MHz, respectively. Thus, the ratio is equal to 6 (7.8 dB) for both bandwidth allocations.
RS power boost, dB	3	REs allocated to RS are given 3 dB more power than REs allocated to data traffic
Total received signal power, dBm	-85.2	Total RS power plus ratio defined in second row minus RS power boost. This term does not include any interference or noise power, and is preferred over the Received Signal Strength Indicator (RSSI), which does typically include the interference and noise power.

AT&T's Coverage and Service Area Prediction Tool

The distance to contours for each lower 700 MHz site is calculated using network design and analysis propagation models. These propagation models are based on the COST-231 Hata model, defined as follows:

$$L = 46.3 + 33.9\log(f) - 13.82\log(H_b) - a(H_m) + [44.9 - 6.55\log(H_b)]\log(d) + C$$

where

$$a(H_m) = (1.1\log(f) - 0.7)H_m - (1.56\log(f) - 0.8)$$

AT&T's Calculation of Geographic Area of Licensed Area and Coverage/Service

The license build performance under Commission rule Section 27.14(g) (i.e. where coverage is provided and service offered) can be determined using the formula,

$$\frac{\text{Covered Licensed Area (sq. mi.)}}{\text{Modified Licensed Area (sq. mi.)}}$$

where:

- Licensed Area = The number of square miles within the licensed service area as generated by Alteryx, a data compiling, analysis, and reporting tool that can conduct spatial calculations, including distances in square miles between set boundaries. Lands

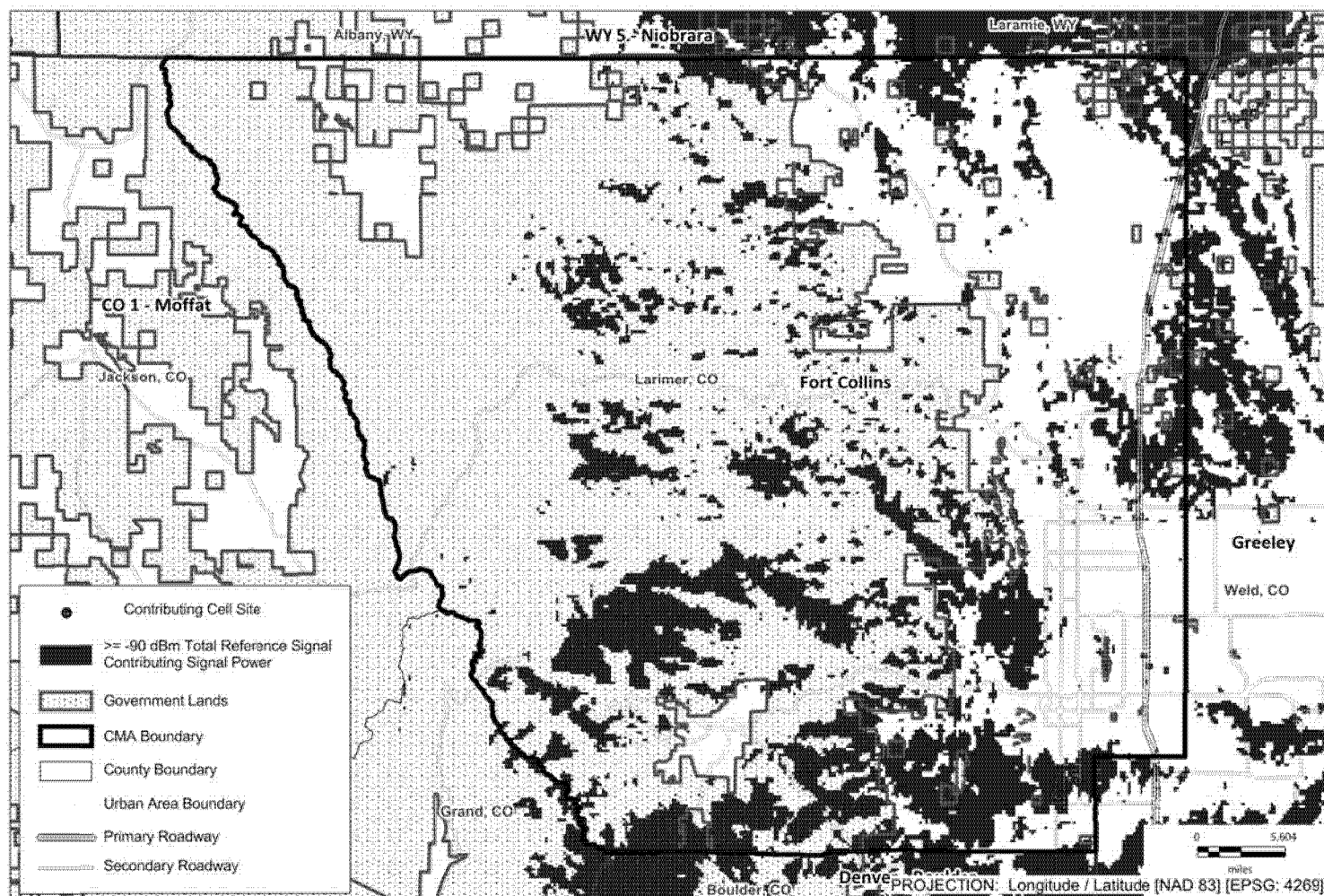
owned by tribal governments and lands held by the Federal Government in trust or for the benefit of a recognized tribe are included in the Licensed Area.

- Covered Licensed Area = The total geographic area within the Licensed Area where coverage is provided and service offered.
- Modified Licensed Area = The Licensed Area minus the geographic area within the Licensed Area that is Government Lands where coverage is provided and service offered.
- Government Lands = Areas that are owned or administered by Federal Government agencies and entities and areas that are owned or managed by States, as explained by Commission Order.¹ The geographic area (sq. mi.) comprising Government Lands was generated based on data from NationalAtlas.com for Federal lands and from the State Parks files in StreetPro and/or the GeoSpatial Data Gateway of the United States Department of Agriculture, National Resources Conservation Service, for State lands. For this license, Government Lands comprising 50.4% of the Licensed Area were excluded from the Licensed Area.

Conclusion

Using the methodologies above as provided by AT&T, coverage is provided and service offered in an area in excess of the 35% performance benchmark.

¹ See Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, *Second Report and Order* at 67 (2007).



WQJQ741
FORT COLLINS - CMA 210, 700 MHz B Block

Reference Copy Only. Do Not Mail to the FCC as an Application.

Submitted: 06/28/2013 at 17:05:21
File Number: 0005839452

FCC 601
Main Form

FCC Application for Radio Service Authorization: Wireless Telecommunications Bureau Public Safety and Homeland Security Bureau

Approved by OMB
3060 - 0798
See instructions for
public burden estimate

1) Radio Service Code: WY	1a) Existing Radio Service Code:
-------------------------------------	----------------------------------

General Information

2) (Select only one) (NT) NE - New RO - Renewal Only AU - Administrative Update NT - Required Notifications MD - Modification RM - Renewal/Modification WD - Withdrawal of Application EX - Requests for Extension of Time AM - Amendment CA - Cancellation of License DU - Duplicate License RL - Registered Location/Link	
3a) If this application is for a <u>D</u> evelopmental License, <u>D</u> emonstration License, or a <u>S</u> pecial Temporary Authorization (STA), enter the code and attach the required exhibit as described in the instructions. Otherwise enter ' <u>N</u> ' (Not Applicable).	(N) <u>D</u> <u>M</u> <u>S</u> <u>N/A</u>
3b) If this application is for Special Temporary Authority due to an emergency situation, enter 'Y'; otherwise enter 'N'. Refer to Rule 1.915 for an explanation of situations considered to be an emergency.	() <u>Yes</u> <u>No</u>
4) If this application is for an Amendment or Withdrawal, enter the file number of the pending application currently on file with the FCC.	File Number
5) If this application is for a Modification, Renewal Only, Renewal/Modification, Cancellation of License, Duplicate License, or Administrative Update, enter the call sign of the existing FCC license. If this is a request for Registered Location/Link, enter the FCC call sign assigned to the geographic license.	Call Sign
6) If this application is for a New, Amendment, Renewal Only, or Renewal/Modification, enter the requested authorization expiration date (this item is optional).	MM DD /
7) Is this application "major" as defined in §1.929 of the Commission's Rules when read in conjunction with the applicable radio service rules found in Parts 22 and 90 of the Commission's Rules? (NOTE: This question only applies to certain site-specific applications. See the instructions for applicability and full text of §1.929).	() <u>Yes</u> <u>No</u>
8) Are attachments (other than associated schedules) being filed with this application?	(Y) <u>Yes</u> <u>No</u>

Fees, Waivers, and Exemptions

9) Is the Applicant exempt from FCC application fees?	(N) <u>Yes</u> <u>No</u>
10) Is the Applicant exempt from FCC regulatory fees?	() <u>Yes</u> <u>No</u>
11a) Does this application include a request for a Waiver of the Commission's Rule(s)? If 'Yes', attach an exhibit providing rule number(s) and explaining circumstances.	(N) <u>Yes</u> <u>No</u>
11b) If 11a is 'Y', enter the number of rule sections involved.	Number of Rule Section(s):
12) Are the frequencies or parameters requested in this filing covered by grandfathered privileges, previously approved by waiver, or functionally integrated with an existing station?	() <u>Yes</u> <u>No</u>

Applicant Information

13) FCC Registration Number (FRN): 0003290673			
14) Applicant/Licensee legal entity type: (Select One.) <input type="checkbox"/> Individual <input type="checkbox"/> Corporation <input type="checkbox"/> Unincorporated Association <input type="checkbox"/> Trust <input type="checkbox"/> Government Entity <input type="checkbox"/> Consortium <input checked="" type="checkbox"/> General Partnership <input type="checkbox"/> Limited Liability Company <input type="checkbox"/> Limited Liability Partnership <input type="checkbox"/> Limited Partnership <input type="checkbox"/> Other (Description of Legal Entity) _____			
15) If the licensee name is being updated, is the update a result from the sale (or transfer of control) of the license(s) to another party and for which proper Commission approval has not been received or proper notification not provided?			() <u>Yes</u> <u>No</u>
16) First Name (if individual):	MI:	Last Name:	Suffix:
17) Legal Entity Name (if other than individual): Cellco Partnership			
18) Attention To: Regulatory			
19) P.O. Box:	And/Or	20) Street Address: 1120 Sanctuary Pkwy, #150 GASA5REG	
21) City: Alpharetta	22) State: GA	23) Zip Code: 30009-7630	
24) Telephone Number: (770)797-1070		25) FAX: (770)797-1036	
26) E-Mail Address: LicensingCompliance@VerizonWireless.com			

27) Demographics (Optional):

Race: <input type="checkbox"/> American Indian or Alaska Native <input type="checkbox"/> Asian <input type="checkbox"/> Black or African-American <input type="checkbox"/> Native Hawaiian or Other Pacific Islander <input type="checkbox"/> White	Ethnicity: <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> Not Hispanic or Latino	Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female
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Real Party in Interest

28) Name of Real Party in Interest of Applicant (If different from applicant):	29) FCC Registration Number (FRN) of Real Party in Interest:
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Contact Information (If different from the applicant)

30) First Name: Licensing	MI: -	Last Name: Manager	Suffix:
31) Company Name: Verizon Wireless			
32) Attention To: Regulatory			
33) P.O. Box:	And /Or	34) Street Address: LicensingCompliance@VerizonWireless.com	
35) City: Alpharetta	36) State: GA	37) Zip Code: 30009-7630	
38) Telephone Number: (770)797-1070		39) FAX: (770)797-1036	
40) E-Mail Address: LicensingCompliance@VerizonWireless.co			

Regulatory Status

41) This filing is for authorization to provide or use the following type(s) of radio service offering (enter all that apply):	
(<input type="checkbox"/>)Common Carrier	(<input type="checkbox"/>)Non-Common Carrier
(<input type="checkbox"/>)Private, internal communications	(<input type="checkbox"/>)Broadcast Services
(<input type="checkbox"/>)Band Manager	

Type of Radio Service

42) This filing is for authorization to provide the following type(s) of radio service (choose all that apply):	
(<input type="checkbox"/>)Fixed	(<input type="checkbox"/>)Mobile
(<input type="checkbox"/>)Radiolocation	(<input type="checkbox"/>)Satellite (sound)
(<input type="checkbox"/>)Broadcast Services	
43) Does the Applicant propose to provide service interconnected to the public telephone network? (<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No	

Alien Ownership Questions (If any answer is 'Y', provide an attachment explaining the circumstances)

44) Is the Applicant a foreign government or the representative of any foreign government?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
45) Is the Applicant an alien or the representative of an alien?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
46) Is the Applicant a corporation organized under the laws of any foreign government?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
47) Is the Applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
48a) Is the Applicant directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof, or by any corporation organized under the laws of a foreign country?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
48b) If the answer to 48a is 'Y', has the Applicant received a ruling(s) under Section 310(b)(4) of the Communications Act with respect to the same radio service involved in this application?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
If the answer to 48b is 'Y', include in the exhibit required by Item 48a the citation(s) of the applicable declaratory ruling(s) by DA/FCC number of the FCC Record citation, if available, release date, and any other identifying information.	
If the answer to 48b is 'N', attach to this filing a date-stamped copy of a request for a foreign ownership ruling pursuant to Section 310(b)(4) of the Communications Act. It is not necessary to file a request for a foreign ownership ruling if the Applicant includes in the exhibit required by Item 48a a showing that the requested license(s) is exempt from the provisions of Section 310(b)(4).	

Basic Qualification Questions

49) Has the Applicant or any party to this application had any FCC station authorization, license or construction permit revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
50) Has the Applicant or any party to this application, or any party directly or indirectly controlling the Applicant, ever been convicted of a felony by any state or federal court?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
51) Has any court finally adjudged the Applicant or any party directly or indirectly controlling the Applicant guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement, or any other means or unfair methods of competition?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
If the answer to any of 49-51 is 'Y', attach an exhibit explaining the circumstances.	

Aeronautical Advisory Station (Unicom) Certification

52) (<input type="checkbox"/>) I certify that the station will be located on property of the airport to be served, and, in cases where the airport does not have a control tower, RCO, or FAA flight service station, that I have notified the owner of the airport and all aviation service organizations located at the airport within ten days prior to application.

Broadband Radio Service and Educational Broadband Service Cable Cross-Ownership

53a) Will the requested facilities be used to provide multichannel video programming service?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
53b) If the answer to question 53a is 'Y', does the Applicant operate, control or have an attributable interest (as defined in Section 27.1202 of the Commission's Rules) in a cable television system whose franchise area is located within the geographic service area of the requested facilities?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
Note: If the answer to question 53b is 'Y', attach an exhibit explaining how the Applicant complies with Section 27.1202 of the Commission's Rules or justifying a waiver of that rule. If a waiver of the Commission Rule(s) is being requested, Item 11a must be answered 'Y'.	

Broadband Radio Service and Educational Broadband Service (Part 27)

54) (For EBS only) Does the Applicant comply with the programming requirements contained in Section 27.1203 of the Commission's Rules?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
Note: If the answer to item 54 is 'N', attach an exhibit explaining how the Applicant complies with Section 27.1203 of the Commission's Rules or justifying a waiver of that rule. If a waiver of the Commission Rule(s) is being requested, Item 11a must be answered 'Y'.	
55) (For BRS and EBS) Does the Applicant comply with Sections 27.50, 27.55, and 27.1221 of the Commission's Rules?	(<input type="checkbox"/>)Yes <input checked="" type="checkbox"/> No
Note: If the answer to item 55 is 'N', attach an exhibit justifying a waiver of that rule(s). If a waiver of the Commission Rule(s) is being requested, Item 11a must be answered 'Y'.	

General Certification Statements

1)	The applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application.
2)	The applicant certifies that grant of this application would not cause the applicant to be in violation of any pertinent cross-ownership or attribution rules.* *If the applicant has sought a waiver of any such rule in connection with this application, it may make this certification subject to the outcome of the waiver request.
3)	The applicant certifies that all statements made in this application and in the exhibits, attachments, or documents incorporated by reference are material, are part of this application, and are true, complete, correct, and made in good faith.
4)	The applicant certifies that neither the applicant nor any other party to the application is subject to a denial of Federal benefits pursuant to §5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. § 862, because of a conviction for possession or distribution of a controlled substance. This certification does not apply to applications filed in services exempted under §1.2002(c) of the rules, 47 CFR § 1.2002(c). See §1.2002(b) of the rules, 47 CFR § 1.2002(b), for the definition of "party to the application" as used in this certification.
5)	The applicant certifies that it either (1) has current required ownership data on file with the Commission, (2) is filing updated ownership data simultaneously with this application, or (3) is not required to file ownership data under the Commission's rules.
6)	The applicant certifies that the facilities, operations, and transmitters for which this authorization is hereby requested are either: (1) categorically excluded from routine environmental evaluation for RF exposure as set forth in 47 C.F.R. 1.1307(b); or, (2) have been found not to cause human exposure to levels of radiofrequency radiation in excess of the limits specified in 47 C.F.R. 1.1310 and 2.1093; or, (3) are the subject of one or more Environmental Assessments filed with the Commission.
7)	The applicant certifies that it has reviewed the appropriate Commission rules defining eligibility to hold the requested license(s), and is eligible to hold the requested license(s).
8)	The applicant certifies that it is not in default on any payment for Commission licenses and that it is not delinquent on any non-tax debt owed to any federal agency.

Signature

56) Typed or Printed Name of Party Authorized to Sign

First Name: Steven	MI: A	Last Name: Regitz	Suffix:
57) Title: Authorized Representative			
Signature: Steven A Regitz			58) Date: 06/28/2013
FAILURE TO SIGN THIS APPLICATION MAY RESULT IN DISMISSAL OF THE APPLICATION AND FORFEITURE OF ANY FEES PAID.			
Upon grant of this license application, the licensee may be subject to certain construction or coverage requirements. Failure to meet the construction or coverage requirements will result in termination of the license. Consult appropriate FCC regulations to determine the construction or coverage requirements that apply to the type of license requested in this application.			
WILLFUL FALSE STATEMENTS MADE ON THIS FORM OR ANY ATTACHMENTS ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. Code, Title 18, §1001) AND/OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION PERMIT (U.S. Code, Title 47, §312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, §503).			

**FCC 601
Schedule K**

**Schedule for
Required Notifications for Wireless Services**

Approved by OMB
3060 – 0798
See 601 Main Form
Instructions
For public burden estimate

1) Purpose

The purpose of this submission: Enter one purpose only - 1, 2, 3, 4, I, S, D, G or H (1) See below and refer to instructions.

Satisfaction of Buildout/Coverage Requirements (Market-based services and State License Radio Service (SL) only)

- 1 1st buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- 2 2nd buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- 3 3rd buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- 4 4th buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)
- I Tribal lands buildout/coverage requirements for the referenced system have been met. (List call signs in 2a)

Satisfaction of Construction Requirements (Site-licensed services only)

- S Construction requirements for the referenced parameters have been met. (List, as applicable, call signs, locations or paths, frequencies, actual date of construction and mobile units in Item 2.)

Request for Regular Authorization for Facilities Operating under Developmental Authority (Paging services only)

- D Notification to request regular authorization for facilities previously operating under developmental authority. (List, as applicable, call signs, locations, frequencies and actual date of construction in Item 2.)

Extended Implementation (Slow Growth) (Land Mobile Services only)

- G Notification of compliance with yearly station construction commitments for licensees with approved extended implementation plans. (List call signs in Item 2a.)
- H Final notification that construction requirements have been met for the referenced system with approved extended implementation plan. (List, as applicable, call signs, locations, frequencies, actual date of construction and mobile units in Item 2.)

2) Call Signs/Locations or Paths/Frequencies

2a) Call Sign	2b) Location Number	2c) Path Number (Microwave only)	2d) Center (Assigned) or Lower Frequency (MHz)	2e) Upper Frequency (MHz)	2f) Actual Date of Construction (mm/dd/yy)	2g) Number of Operational Mobiles (see instructions)
WQJQ746						

3) Certification

By signing the Main Form, the applicant certifies, as set forth in 47 C.F.R. §1.946(c) of the Commission's rules, that it has commenced service or operations by the expiration of its construction period, or met its coverage or substantial service obligations by the expiration of its coverage period.

Attachment(s):

Type	Description	Date Entered
O	<u>Map Exhibit</u>	06/28/2013
O	<u>Narrative Engineering Exhibit</u>	06/28/2013

700 MHz CONSTRUCTION NOTIFICATION

Licensee: Cellco Partnership
Call Sign: WQJQ746
Grant Date: 11/26/2008
Market: Texarkana, TX - Texarkana, AR
Frequency Block: B

Pursuant to Section 27.14 of the Commission's Rules, Cellco Partnership d/b/a Verizon Wireless ("Cellco"), hereby gives notice of and demonstrates satisfaction of the four-year construction requirement for the license. Section 27.14(g) requires lower 700 MHz Block B licensees to provide signal coverage and offer service over at least 35% of the service area for this license (the "Licensed Area") no later than June 13, 2013. Section 27.14(k) of the Commission's rules require licensees to demonstrate compliance with the performance benchmark by filing a construction notification no later than 15 days after the build-out deadline.

Background

Cellco acquired this 700 MHz B Block license and others at auction. As discussed in greater detail below, Cellco engaged in meaningful efforts in anticipation of bringing the spectrum into use, including designing the network, both in terms of its technical configuration and location of cell sites, and worked with vendors to develop both network equipment and customer devices. Ultimately, Cellco determined that AWS is the most cost-effective and spectrally efficient way for Verizon Wireless to supplement its Upper C Block spectrum in order to provide capacity for growth in customers' use of LTE." It thus chose to sell the 700 MHz B Block licenses as part of a series of recent transactions in which Verizon Wireless has acted to rationalize its spectrum holdings.

Cellco has contracted to transfer its remaining 700 MHz B Block licenses to an affiliate of AT&T ("AT&T") and pending Commission approval of that transfer, has leased the spectrum to AT&T. Pursuant to Section 1.9020(d)(5)(i) of the Commission's rules, Cellco may attribute to itself the build out or performance activities of its spectrum lessee for purposes of complying with the build out requirement. Accordingly, this exhibit is based, in large part, upon information from AT&T and all information as to coverage is based upon AT&T's network deployment pursuant to the lease.

As shown herein, Cellco has satisfied its four-year construction requirement by relying on its lessee's activities in providing signal coverage and offering service over more than 35% of the Licensed Area.

Build Showing

The Licensed Area extends over 2059 square miles (after excluding any Government Lands without coverage). As of the date of this filing, coverage is provided and service is offered within 870 square miles (42%) of that Licensed Area. A coverage map providing a visual

representation of the areas where AT&T is providing coverage and service is included with this performance showing. The level of coverage and service may increase through the deployment of additional facilities before the build-out deadline. The calculations and methodology described below provide the engineering justification to support this build performance showing.

Downlink (“DL”) Signal Level

Mobile voice and data services are being provided in the Licensed Area using the long term evolution (“LTE”) air interface at a minimum signal level of -90 dBm for both 5 MHz x 5 MHz deployments (B Block only) and 10 MHz x 10 MHz (when combined with an AT&T C Block license) deployments. This -90 dBm signal level corresponds to the “total” Reference Signal (“RS”) power, which is related to the more commonly specified Reference Signal Received Power (“RSRP”). Table 1 demonstrates the relationship between the RS and the RSRP. RSRP is measured on a per Resource Element (“RE”) basis where the RE corresponds to a single orthogonal frequency-division multiplexing (“OFDM”) sub-carrier with 15 kHz bandwidth. To convert to total RS power the RSRP per RE must be multiplied by the total number of REs allocated to RSs. Thus, although RSRP per RE is 3 dB lower for a 10 MHz x 10 MHz deployment than for a 5 MHz x 5 MHz deployment, there are twice as many REs or sub-carriers allocated to RSs for a 10 MHz x 10 MHz deployment, effectively offsetting the 3 dB difference in power per RE. This analysis assumes equal total transmit power for a 5 MHz x 5 MHz deployment and a 10 MHz x 10 MHz deployment.

Table 1. AT&T’s Derivation of RSRP per RE from total RS power.

Parameter	5x5 MHz	10x10 MHz	Comment
Total RS power, dBm	-90	-90	Summation of power of all REs that carry RSs.
Terminal loss, dB	-5	-5	Typical terminal antenna gain at lower 700 MHz. This loss must be included since it is not included in the total RS power calculation.
Service body loss, dB	-1	-1	Typical body loss for data card. This loss must be included since it is not included in the total RS power calculation.
Total RS power at Rx antenna port, dBm	-96	-96	Summation of above quantities.
Number of REs allocated to RS in dB	17	20	In OFDM symbols that carry the RS 50 REs are allocated for 5 MHz and 100 REs are allocated for 10 MHz .
RSRP per RE, dBm	-113	-116	Total RS power at Rx antenna port (-96) in dBm minus the number of REs allocated to RS in dB (17 or 20).

The resulting DL throughput that can be supported based upon the above total RS and RSRP per RE is a function of the Signal to Interference plus Noise Ratio (“SINR”) on the Physical Downlink Shared Channel (“PDSCH”), and the number of Resource Blocks (“RBs”) allocated to

a user. For a LTE network, a RB is defined as 12 REs in the frequency dimension and 7 OFDM symbols in the time dimension, corresponding to a time duration of 0.5 milliseconds (“ms”). An RB-pair spans what is referred to as a sub-frame, which is 1 ms in duration, and is the smallest interval over which data can be scheduled. Table 2 calculates the received SINRs for a 5 MHz x 5 MHz deployment and for a 10 MHz x 10 MHz deployment, and the resulting number of RBs required to support at least 1 and 2 Mbps, respectively.

As shown in Table 2, the SINR is the ratio of the received PDSCH signal power over the summation of the interference plus noise, where each figure in this ratio is calculated on a per RE basis. The PDSCH per RE is equal to the RSRP per RE, even though this LTE deployment uses a 3 dB RS power boost since at the cell edge, which is the area of interest, the transmit diversity mode is enabled for the PDSCH, which implies that the same data is transmitted in both transmit paths (spatial multiplexing is not enabled). The effect of this at the terminal receiver is a factor of two power combining gain for the PDSCH, which offsets the 3 dB RS power boost. The RSRP does not realize this power combining gain since to prevent serving cell RS-to-RS interference at the receiver, the REs carrying RSs in transmit path 1 are different from the REs carrying RSs in transmit path 2.

The interference calculated is due solely to the RS interference from the other cells where the interfering RSRP levels are assumed to be the same as the serving cell: -113 dBm for 5 MHz x 5 MHz deployments and -116 dBm for 10 MHz x 10 MHz deployments. These latter values are suitably adjusted by the cell geometry (also referred to as the Carrier to Interference Ratio), and other factors, including multiplication by the ratio of the total number of REs used for RS in a sub-frame to the total number of REs per sub-frame. This latter factor converts the RS interference from an instantaneous power level to an average power level over the sub-frame. The interference term does not include any interference due to the PDSCH in other cells, which is consistent with the assumption of a zero data loading condition.

The resultant SINRs, including a conservative implementation margin of 3 dB, are shown in Table 2 as 1.8 and 0.5 dB for 5 MHz x 5 MHz deployments and 10 MHz x 10 MHz deployments, respectively. Link level performance curves are then used to determine the resulting bit rates per RB for each SINR, which are shown as 0.132 and 0.109 Mbps, respectively for the link level assumptions stated. Thus, to support at least 1 Mbps in 5 MHz x 5 MHz deployments will require 8 RBs, and to support at least 2 Mbps in 10 MHz x 10 MHz deployments will require 19 RBs. Since there are 25 and 50 total RBs for 5 MHz x 5 MHz deployments and 10 MHz x 10 MHz deployments the above throughputs are supported. Since RB allocations are in integer values, the values calculated by dividing the target throughputs by the bit rate per RB are rounded up to the next highest integer. Thus, the actual throughputs turn out to be slightly greater than the target values. If fewer RBs are allocated, the throughput is decreased, and conversely, if more RBs are allocated, the throughput is increased. As the load increases in the network, the throughput will decrease, but this can be offset somewhat by allocating more RBs up to the maximum available. In addition, there is nothing to preclude allocating all of the available RBs to a given user particularly in initial deployments with no or very light loading. In Monte Carlo simulations using the Atoll RF planning tool, it was shown that in a couple of representative markets with 1 to 2 users randomly distributed in each sector

corresponding to a relatively low load that the resulting user throughput for a 5 MHz channel bandwidth was in the range of 1.7 to 2 Mbps at an RSRP per RE = PDSCH per RE = -113 dBm. These simulations assumed that the users had access to all of the available RBs. An approximate doubling of this throughput is estimated for a 10 MHz x 10 MHz deployment.

Table 2 also calculates the total PDSCH signal power for the RB allocations shown to be -93.2 and -92.4 dBm respectively for 5 MHz x 5 MHz deployments and 10 MHz x 10 MHz deployments. These values represent the actual signal power that the terminal receiver has to work with to recover the transmitted data stream. Although it is often convenient to do calculations on a per RE basis, the receiver processes the total signal power.

Table 2. AT&T's Derivation of SINR, number of RBs required and total PDSCH power.

Parameter	5 MHz	10 MHz	Comment
Received average power of PDSCH per RE, dBm	-113	-116	PDSCH per RE is equal to RSRP per RE since 3 dB RS power boost is countered by 3 dB power combining gain of PDSCH when in transmit diversity mode at cell edge.
Receive thermal noise power per RE, dBm	-122.2	-122.2	Calculated in the RE bandwidth of 15 kHz with a 10 dB terminal noise figure.
Interference power per RE, dBm	-119.8	-122.8	In this analysis the interference is restricted to the RS interference from other cells assuming (1) a 95 th percentile cell geometry value of -2.2 dB; (2) an instantaneous to average power conversion factor of about -11.7 dB, and (3) RSRP values before adjustment of -113 and -116 dBm for 5 and 10 MHz.
"Interference plus Noise" per RE, dBm	-117.8	-119.5	Linear addition of interference and noise.
Received SINR, dB	4.8	3.5	PDSCH per RE minus "Interference plus Noise" per RE.
Implementation margin, dB	3	3	Margin to account for any additional losses not considered.
Received SINR with implementation margin, dB	1.8	0.5	Received SINR minus implementation margin.
Bit rate per RB, Mbps	0.132	0.109	Key link level assumptions include: (1) MIMO mode = transmit diversity; (2) Extended Pedestrian A (EPA) channel model with 5 Hz Doppler frequency; and (3) maximum of 4 HARQ transmissions.
Number of RBs required	8	19	Number of RBs required to support at least 1 and 2 Mbps. Since allocations are in integer number of RBs the respective values calculated by dividing the throughputs by the bit rate per RB are rounded up to the next

			highest number.
Actual throughput supported, Mbps	1.06	2.07	Bit rate per RB times number of RBs.
Number of REs allocated to PDSCH in dB	19.8	23.6	8*12 = 96 REs for 5 MHz, 19*12 = 228 REs for 10 MHz.
Total received PDSCH signal power, dBm	-93.2	-92.4	Summation of PDSCH per RE and number of REs allocated to PDSCH.

AT&T's Uplink ("UL") Target Data Rates

The target data rates (i.e. throughputs) that can be supported on the LTE UL are a function of the Maximum Allowable Path Loss (MAPL) that can be supported on the DL, which is based upon a DL signal level corresponding to a total RS power of -90 dBm as defined above. As shown in Table 3 below, the MAPL that corresponds to a -90 dBm total RS power is 104.1 dB for both 5 MHz x 5 MHz and 10 MHz x 10 MHz deployments. Even though the RS Energy per Resource Element (EPRE) for a 5 MHz x 5 MHz (23 dBm) is greater than for a 10 MHz x 10 MHz (20 dBm) deployment (see row 4), the total RS power for each of the two transmit paths for both bandwidth allocations are equivalent and equal to 40 dBm because the number of REs allocated to 10 MHz is twice that allocated to 5 MHz (100 REs compared to 50 REs; see row 5).

Table 3. AT&T's Derivation of Maximum Allowable Path Loss (MAPL) (All calculations are in dBs).

Parameter	5 MHz x5 MHz	10 MHz x10 MHz	Comment
Transmit power per transmit path, dBm	44.77	44.77	30 watts of transmit power for each of two transmit paths (total 60 watts). Our current LTE deployment is based upon two transmit paths at the base station and the same total power for both bandwidth allocations.
Total number of subcarriers in dB	24.77	27.77	300 subcarriers for 5 MHz x 5 MHz 600 subcarriers for 10 MHz x 10 MHz
Reference Signal (RS) power boost, dB	3	3	Resource Elements (REs) allocated to RS are given 3 dB more power than REs allocated to data traffic
RS Energy Per RE (EPRE) per transmit path, dBm	23	20	Transmit power minus total number of subcarriers plus RS power boost
Number of REs allocated to RS in dB	17	20	In OFDM symbols that carry the RS, 50 REs are allocated for 5 MHz x 5 MHz, and 100 REs are allocated for 10 MHz x 10 MHz
Total RS power for each transmit path,	40	40	RS EPRE plus number of REs allocated to RS

dBm			
Base station antenna gain, dBi	14.8	14.8	Antenna gain representative of a 6 foot dual-polarized antenna at 700 MHz
Cable loss, dB	0.5	0.5	This loss is based upon Remote Radio Head (RRH) located at tower top thus minimizing cable length
Total RS transmit EIRP, dBm	54.3	54.3	Total RS power plus base station antenna gain minus cable loss
Shadowing margin, dB	7.3	7.3	Based upon shadowing margin standard deviation of 7 dB for rural environment and 95% cell area coverage probability
Best server selection gain, dB	3.1	3.1	A mobile at cell edge can handover to a neighbor cell with more favorable shadowing
Total RS power signal level, dBm	-90	-90	Coverage signal level defined above
MAPL, dB	140.1	140.1	Total RS transmit EIRP minus shadowing margin plus best server selection gain minus total RS power signal level

An UL link budget is used to determine the UL throughput that can be supported based upon a MAPL of 140.1 dB. Table 4 summarizes the link budget analyses for 128 kbps and 256 kbps UL data service. As shown in Table 4, the resulting MAPLs for no loading (interference margin = 0 dB) are 143.5 dB for 128 kbps and 140.3 dB for 256 kbps. Using linear extrapolation, the UL throughput supported for a MAPL of 140.1 dB is about 264 kbps, as throughput increases with decreasing MAPL. Assuming an interference margin of 3 dB, which corresponds to 100% loading in a somewhat coverage-limited scenario, the MAPLs for 128 kbps and 256 kbps each decrease by 3 dB to 140.5 dB and 137.3 dB, respectively. Using linear interpolation, the resulting UL throughput for a MAPL of 140.1 dB is about 144 kbps.

Table 4. AT&T's LTE UL link budgets to support 128 and 256 kbps.

Parameter	Units	128 kbps	256 kbps	Comment
Average effective data rate	kbps	128	256	UL throughput supported
Number of Resource Blocks (RBs)		3	4	Close to optimum for specified throughput. There is a trade-off between receiver noise bandwidth and required SINR.
Mobile transmit power	dBm	23	23	Transmit power for LTE mobiles
Mobile antenna gain	dBi	-5	-5	Representative device antenna gain at 700 MHz
Service body loss	dB	1	1	Typical body loss for wireless data card

Mobile transmit EIRP	dBm	17	17	Mobile transmit power plus mobile antenna gain minus service body loss
Receive noise power density	dBm/Hz	-174	-174	Standard noise power spectral density at room temperature
Base station noise figure	dB	2.5	2.5	Typical value for LTE eNodeB
Target UL SINR	dB	-0.4	1.5	Based upon the Extended Vehicular A (EVA) channel model at 3 km/h; 10% Block Error Rate (BLER) for the first HARQ transmission; MCS2 for 128 kbps, MCS5 for 256 kbps.
Base station sensitivity	dBm	-114.6	-111.4	SINR plus receive noise power spectral density plus base station noise figure plus receiver bandwidth, where the latter is equal to number of RBs times 180 kHz.
Base station antenna gain	dBi	14.8	14.8	Antenna gain representative of a 6 foot dual-polarized antenna at 700 MHz
Cable loss	dB	0.5	0.5	This loss is based upon RRH located at tower top thus minimizing cable length
Interference margin	dB	0.0	0.0	No load condition
Frequency selective scheduling gain	dB	1.8	1.8	Gain achieved based upon scheduler being able to select best RBs for a given user
Best server selection gain	dB	3.1	3.1	A mobile at cell edge can handover to a neighbor cell with more favorable shadowing
Shadowing margin	dB	7.3	7.3	Based upon shadowing margin standard deviation of 7 dB for rural environment and 95% cell area coverage probability
MAPL	dB	143.5	140.3	Mobile transmit EIRP minus base station sensitivity plus base station antenna gain minus cable loss minus interference margin plus frequency selective scheduling gain plus best server selection gain minus shadowing margin

In summary, the UL throughput that can be supported ranges from about 144 kbps to about 264 kbps depending on loading. These throughputs are representative of what is achievable in LTE deployments at the cell edge. Note that these values are the same for both 5 MHz x 5 MHz and 10 MHz x 10 MHz deployments, as it has been assumed that the number of RBs allocated is the same for both bandwidths.

AT&T's Conversion of RS to Total Received Signal Power.

The signal level for this license is defined in terms of total RS power. If the Commission seeks to convert the total RS power to the total received signal power, the following conversion chart is provided:

Table 5. Conversion from total RS power to total received signal power.

Parameter	Value	Comment
Total RS power, dBm	-90	Coverage signal level defined above
Ratio of number of REs carrying data to number of REs carrying reference signals, dB	7.8	The number of REs that carry downlink data in OFDM symbols dedicated to data transmission is equal to 300 and 600 for 5 MHz x 5 MHz and 10 MHz x 10 MHz, respectively. The number of REs that carry reference signals in OFDM symbols is equal to 50 and 100 for 5 MHz x 5 MHz and 10 MHz x 10 MHz, respectively. Thus, the ratio is equal to 6 (7.8 dB) for both bandwidth allocations.
RS power boost, dB	3	REs allocated to RS are given 3 dB more power than REs allocated to data traffic
Total received signal power, dBm	-85.2	Total RS power plus ratio defined in second row minus RS power boost. This term does not include any interference or noise power, and is preferred over the Received Signal Strength Indicator (RSSI), which does typically include the interference and noise power.

AT&T's Coverage and Service Area Prediction Tool

The distance to contours for each lower 700 MHz site is calculated using network design and analysis propagation models. These propagation models are based on the COST-231 Hata model, defined as follows:

$$L = 46.3 + 33.9\log(f) - 13.82\log(H_b) - a(H_m) + [44.9 - 6.55\log(H_b)]\log(d) + C$$

where

$$a(H_m) = (1.1\log(f) - 0.7)H_m - (1.56\log(f) - 0.8)$$

AT&T's Calculation of Geographic Area of Licensed Area and Coverage/Service

The license build performance under Commission rule Section 27.14(g) (i.e. where coverage is provided and service offered) can be determined using the formula,

$$\frac{\text{Covered Licensed Area (sq. mi.)}}{\text{Modified Licensed Area (sq. mi.)}}$$

where:

- Licensed Area = The number of square miles within the licensed service area as generated by Alteryx, a data compiling, analysis, and reporting tool that can conduct spatial calculations, including distances in square miles between set boundaries. Lands

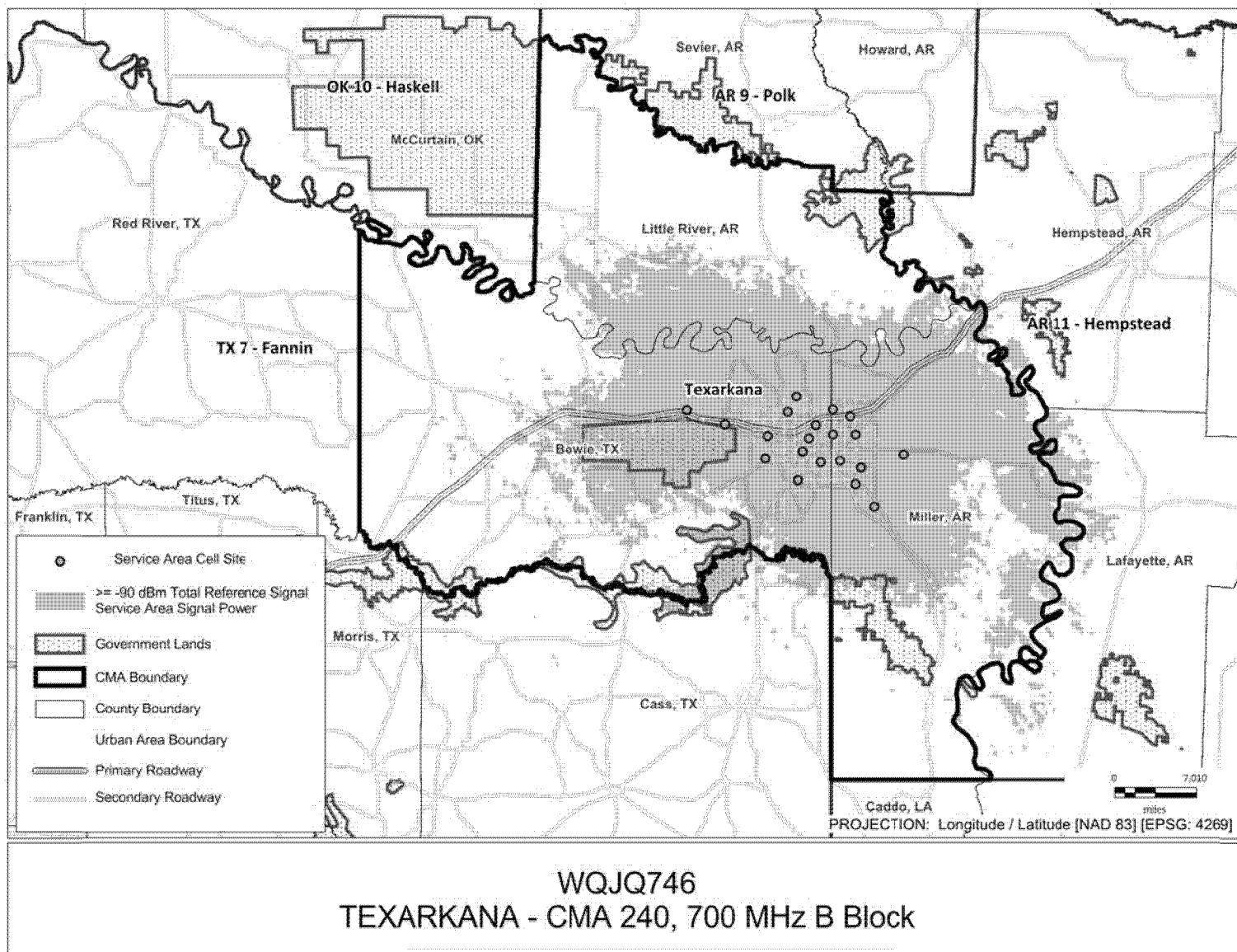
owned by tribal governments and lands held by the Federal Government in trust or for the benefit of a recognized tribe are included in the Licensed Area.

- Covered Licensed Area = The total geographic area within the Licensed Area where coverage is provided and service offered.
- Modified Licensed Area = The Licensed Area minus the geographic area within the Licensed Area that is Government Lands where coverage is provided and service offered.
- Government Lands = Areas that are owned or administered by Federal Government agencies and entities and areas that are owned or managed by States, as explained by Commission Order.¹ The geographic area (sq. mi.) comprising Government Lands was generated based on data from NationalAtlas.com for Federal lands and from the State Parks files in StreetPro and/or the GeoSpatial Data Gateway of the United States Department of Agriculture, National Resources Conservation Service, for State lands. For this license, Government Lands comprising 3% of the Licensed Area were excluded from the Licensed Area.

Conclusion

Using the methodologies above as provided by AT&T, coverage is provided and service offered in an area in excess of the 35% performance benchmark.

¹ See Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, WT Docket No. 06-150, *Second Report and Order* at 67 (2007).



REDACTED – FOR PUBLIC INSPECTION

**Bates Numbers ATT-VZWG00000603 through ATT-VZWG00000849 are redacted as
Highly Confidential Information**